ABB MEASUREMENT & ANALYTICS | OPERATING INSTRUCTION | OI/AZ10-EN REV. B

AZ10 oxygen analyzer

Combustion gas analysis

Superior technology and quality from the world leader in oxygen measurement

Measurement made easy

AZ10 oxygen analyzer

Introduction

The AZ10 is the latest in a long line of high-quality combustion gas analyzers from ABB. The probe, based on a zirconium oxide cell, is mounted in close contact with the process. The resulting direct measurement provides accurate and rapid oxygen reading for combustion control/optimization and emissions monitoring purposes.

The AZ10 has been designed for extended periods of maintenance-free operation. The modular design, with reduced component count, improves the reliability and robustness of the system and simplifies breakdown repair if it occurs.

Kits containing all the parts needed to complete on-site repairs are available from ABB, ensuring service personnel can effect repairs quickly and efficiently at minimum cost.

For more information

Further publications for the AZ10 oxygen analyzer are available for free download from: www.abb.com/measurement

or by scanning this code:

Links and reference numbers for AZ10 publications are shown below:

	Search for or click on:
AZ10 oxygen analyzer – Data Sheet	DS/AZ10
AZ20 oxygen analyzer – User Guide	IM/AZ20E
Endura AZ10 oxygen analyzer – Leaflet Key specifications at a glance	LFT/ENDURA/AZ10

Contents

1 Health & Safety

Information in this manual is intended only to assist our customers in the efficient operation of our equipment. Use of this manual for any other purpose is specifically prohibited and its contents are not to be reproduced in full or part without prior approval of the Technical Publications Department.

⚠ WARNING

The installation of the equipment should be performed exclusively by personnel specialized and authorized to work on electrical installations, in accordance with relevant local regulations.

To ensure that our products are safe and without risk to health, the following points must be noted:

- The relevant sections of these instructions must be read carefully before proceeding. Failure to do so could result in bodily harm or damage to the equipment.
- Warning labels on containers and packages must be observed.
- Installation, operation, maintenance and servicing must only be carried out by suitably trained personnel and in accordance with the information given.
- Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and/or temperature.
- Chemicals must be stored away from heat, protected from temperature extremes and powders kept dry. Normal safe handling procedures must be used.
- When disposing of chemicals ensure that no two chemicals are mixed.

Safety advice concerning the use of the equipment described in this manual or any relevant Material Safety Data Sheets (where applicable) may be obtained from the Company address on the back cover, together with servicing and spares information.

1.1 Electrical safety – CEI/IEC 61010-1

This equipment complies with the requirements of CEI/IEC 61010-1 'Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use' and complies with US NEC 500, NIST and OSHA.

If the equipment is used in a manner NOT specified by the Company, the protection provided by the equipment may be impaired.

1.2 Document symbols

Symbols that appear in this document are explained below:

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

Note
'Note' indicates useful or important information about the product.

...1 Health & Safety

1.3 Information on ROHS Directive 2011/65/EU (RoHS II)

ABB, Industrial Automation, Measurement & Analytics, UK, fully supports the objectives of the ROHS II directive. All in-scope products placed on the market by IAMA UK on and following the 22nd of July 2017 and without any specific exemption, will be compliant to the ROHS II directive, 2011/65/EU.

1.4 Potential safety hazards

The following potential safety hazards are associated with operating the system:

- Electrical (line voltage)
- High operational temperature on probe
- Probe weight

⚠ WARNING

Bodily injury.

To ensure safe use when operating this equipment, the following points must be observed:

- Up to 240 V AC may be present. Be sure to isolate the supply before removing the terminal cover.
- Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and/or temperature.

Safety advice concerning the use of the equipment described in this manual or any relevant Material Safety Data Sheets (where applicable) can be obtained from the Company, together with servicing and spares information.

1.5 Safety standards

This product has been designed to satisfy the requirements of IEC61010-1 'Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use' and complies with US NEC 500, NIST and OSHA.

1.6 Product symbols

Symbols that appear on this product are shown below:

Protective earth (ground) terminal.

Functional earth (ground) terminal.

This symbol, when noted on a product, indicates a potential hazard which could cause serious personal injury and/or death. The user should reference this instruction manual for operation and/or safety information.

This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and/or electrocution exists and indicates that only individuals qualified to work with hazardous voltages should open the enclosure or remove the barrier.

Recycle separately from general waste under the WEEE directive.

1.7 Product recycling and disposal (European customers only)

ABB is committed to ensuring that the risk of any environmental damage or pollution caused by any of its products is minimized as far as possible. The European Waste Electrical and Electronic Equipment (WEEE) Directive that initially came into force on August 13 2005 aims to reduce the waste arising from electrical and electronic equipment; and improve the environmental performance of all those involved in the life cycle of electrical and electronic equipment. In conformity with European local and national regulations, electrical equipment marked with the above symbol may not be disposed of in European public disposal systems after 12 August 2005.

NOTICE

For return for recycling, please contact the equipment manufacturer or supplier for instructions on how to return end-of-life equipment for proper disposal.

1.8 End-of-life disposal

The transmitters contain a small lithium battery that must be disposed of responsibly in accordance with local environmental regulations. The remainder of the equipment does not contain any substance that causes undue harm to the environment and must be disposed of in accordance with the Directive on Waste Electrical and Electronic Equipment (WEEE). It must not be disposed of in Municipal Waste Collection.

1.9 Service and spares

Only personnel from ABB or its approved representative(s) is (are) authorized to attempt repairs to the system and only components formally approved by the manufacturer should be used. Any attempt at repairing the instrument in contravention of these principles could cause damage to the instrument and corporal injury to the person carrying out the repair. It renders the warranty null and void and could compromise the correct working of the instrument and the electrical integrity or the CE compliance of the instrument. If you have any problems with installation, starting, or using the instrument please contact the company that sold it to you. If this is not possible, or if the results of this approach are not satisfactory, please contact the manufacturer's Customer Service.

2 System overview

These Operating instructions provide the following information:

- schematics showing test gas requirements
- electrical connection details between the AZ10 probe and AZ10 transmitter (and AutoCal option)

⚠ WARNING

- System configuration must be performed only by users or personnel with approved access rights (user privileges).
- Read all relevant sections of this guide before configuring the system or modifying system parameters.
- Install and use this equipment as detailed in this guide. Install and use associated equipment in accordance with the relevant national and local standards.

The AZ10 oxygen probe measures oxygen concentration in process gas using an in situ 'wet analysis' method. The 'wet analysis' method avoids measurement error (typically 20 % of reading higher than the actual value) that is introduced by a sampling system using the 'dry analysis' method.

System equipment comprises a (process-mounted) AZ10 probe controlled by the transmitter. During operation, a zirconia cell within the probe is held at a constant temperature of 700 °C (1292 °F) by a probe heater and control thermocouple assembly. If the heater control circuitry or software fails (unsafe), the probe heater power supply is switched off, ensuring the system fails 'safe' and protecting the heater from an over-temperature failure.

An output generated at the zirconia cell is processed in the transmitter giving a locally displayed O2 reading and a 4 to 20 mA retransmission signal (over any range between 0 and 25% O_2).

2.1 Cybersecurity

This product is designed to be connected to and to communicate information and data via a digital communication interface. It is your sole responsibility to provide and continuously ensure a secure connection between the product and your network or any other network (as the case may be). You shall establish and maintain any appropriate measures (such as but not limited to the application of authentication measures etc.) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information.

ABB Ltd and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

3 Mechanical installation

3.1 General installation requirements

⚠ WARNING

- Before installing the probe, check the probe data and alteration labels on the head of the probe – see Figure 1.
- Select a location away from strong electrical and magnetic fields. If this is not possible, particularly in applications where mobile communications equipment is expected to be used, screened cables within flexible, earthed metal conduit must be used.
- Before installing the probe, read the Safety notes in Section 1, page 3.

⚠ CAUTION

- Handle the probe with care. The probe inners have fragile ceramic components that are easily damaged.
- The probe must be used with clean, ash-free process gases only.
- Thermal shock may break the zirconia cell if the process is cleaned using water. If this method of cleaning is employed, remove the probe from the process prior to cleaning.

3.2 Unpacking

⚠ CAUTION

Visually inspect equipment for damage after unpacking. Do not install damaged or faulty equipment.

⚠ WARNING

- Handle the probe with care and do not subject it to hammer blows or other sharp shocks. The probe inners have fragile ceramic components that can be damaged.
- It is recommended to retain the protective probe packing materials to allow for re-shipping in the unlikely event of a return.

3.3 Identifying the probe

The probe is identified by a label attached to the probe head. Separate transmitter-specific labels are attached to the system transmitter.

⚠ CAUTION

Details on the probe label are unique to the cell/probe combination the label is attached to and cannot be used to identify any other probe or system.

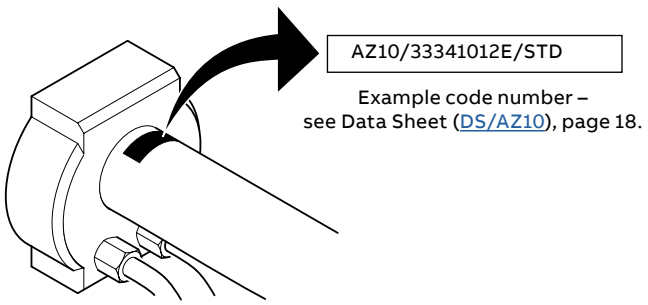


Figure 1 Location of probe label

3.4 Siting

Select a position where the intake is located in the main gas stream. Gas temperature must be in the range 20 to 800 °C (68 to 1,472 °F). The surface temperature of the duct must not exceed 400 °C (752 °F).

Avoid positions where obstructions or bends prevent installation (and subsequent removal) of the probe.

Avoid positions where vibration levels induced by other plant could result in mechanical failure of the probe.

To prevent acid dew point corrosion, the probe mounting flange and body must be thermally lagged if the temperature of the flue wall and probe mounting flange is <150 °C (<302 °F) when the process is operating.

Maintain the probe terminal head temperature within the range -20 to 70 °C (-4 to 158 °F).

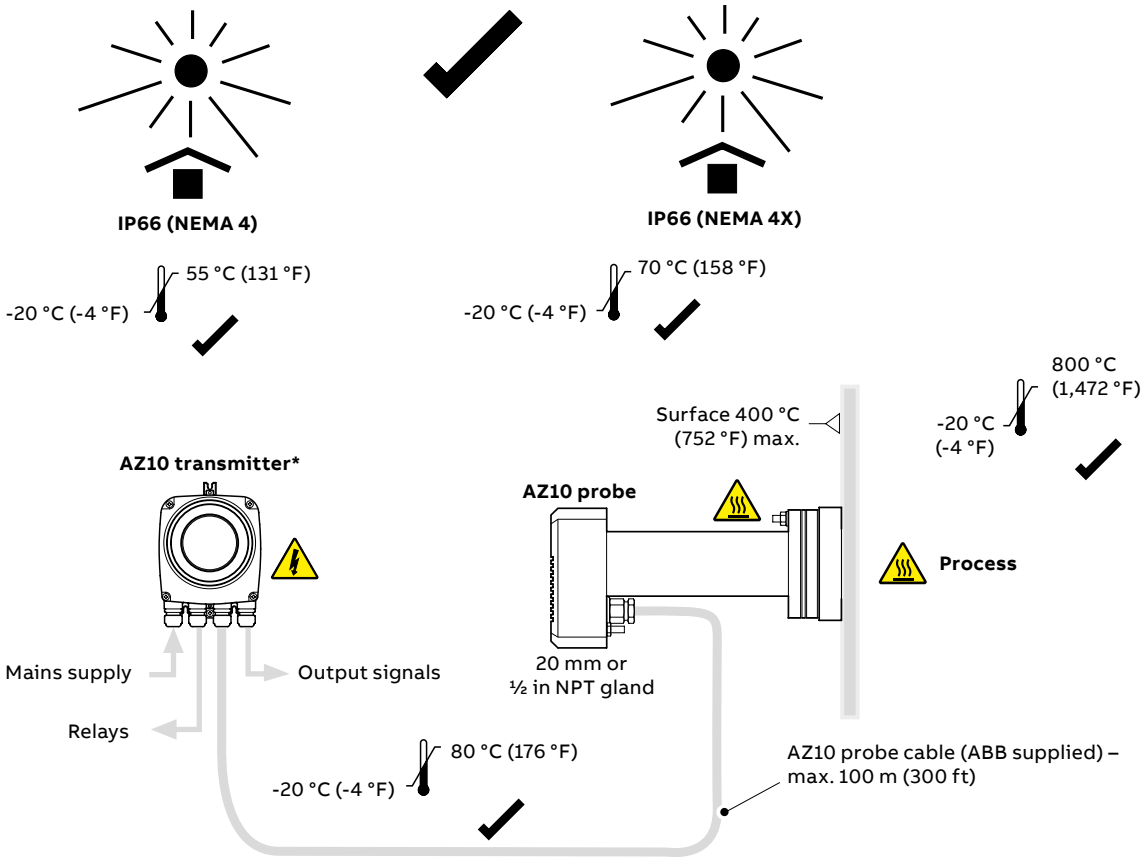
⚠ CAUTION

Do not exceed the probe terminal head maximum operating temperature. The probe must be sited in an area where:

- radiated heat from the process does not cause the maximum temperature to be exceeded

Probe dimensions are shown in Figure 3, page 8. A clearance of at least 25 mm (1 in) in excess of the overall probe length is necessary to enable installation or removal.

3.4.1 Siting overview



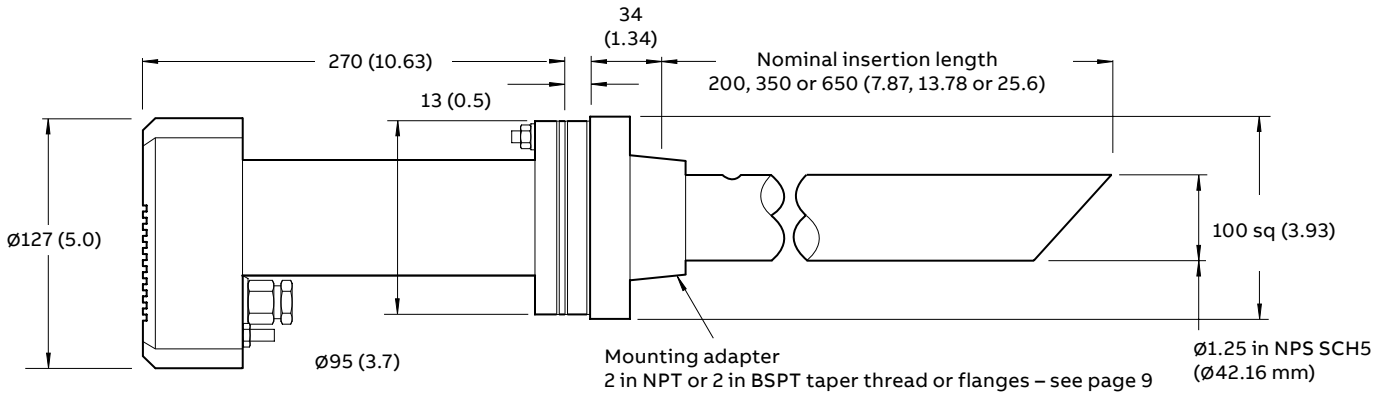
* The probe can withstand 35 kPa (5.1 psi) – positive or negative pressure. Pressure compensation is required above 5 kPa (0.7 psi) – the transmitter can supply fixed pressure compensation.

Figure 2 Probe and transmitter temperature/environmental limits and power input/output supplies

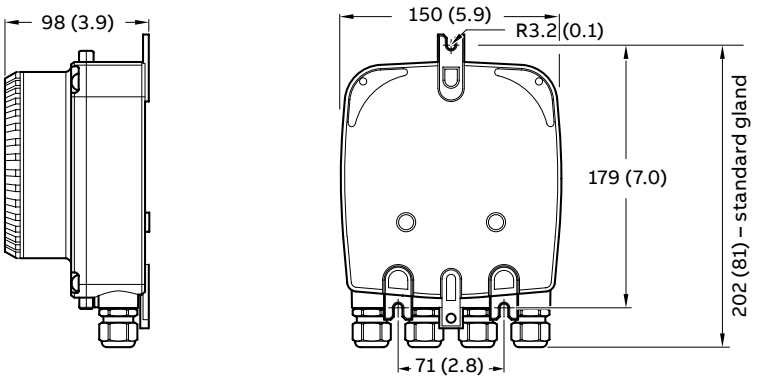
4 Dimensions

Dimensions in mm (in)

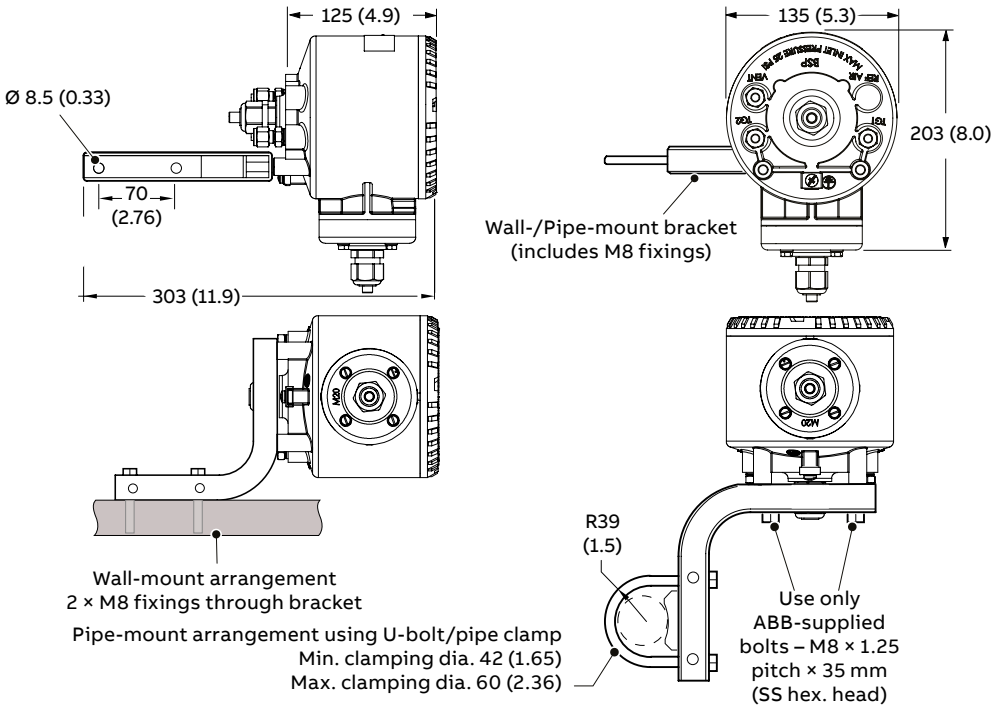
4.1 AZ10 probe



4.2 AZ10 transmitter



4.3 Autocalibration unit



5 Probe flanges (all probe lengths) and mounting plates for standard probe flanges

Dimensions in mm (in)

Flange type	A	B	C (Ø)	D (PCD)
ANSI 2.5 in 150	177.8 (7.00)	12 (0.47)	19 (0.75)	139.7 (5.50)
ANSI 3 in 150	190.5 (7.50)	12 (0.47)	19 (0.75)	152.4 (6.00)
DIN 65 PN16	185 (7.28)	12 (0.47)	18 (0.70)	145 (5.70)

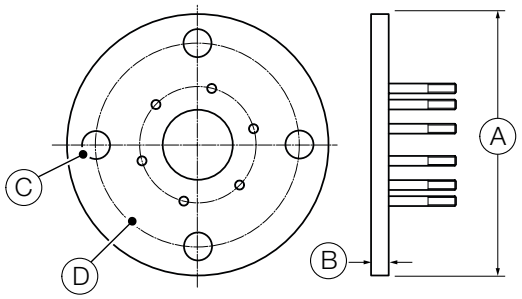


Figure 3 4-Hole probe flange types and dimensions

Flange type	A	B	C (Ø)	D (PCD)
DIN 80 PN16	200 (7.87)	12 (0.47)	18 (0.70)	160 (6.30)

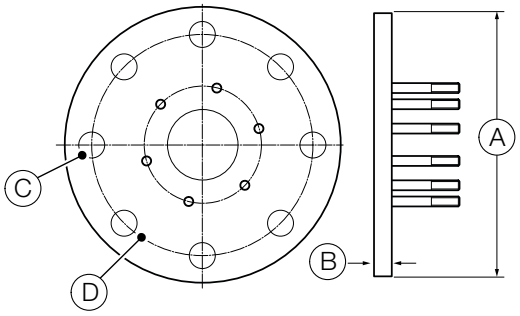


Figure 4 8-Hole probe flange types and dimensions

Flange type	A	B	C	D	E	F	G (PCD)
2 in NPT	48 (1.88)	20 (0.79)	48 (1.89)	2 in thread	100.8 (3.96)	100.8 (3.96)	80 (3.15)
2 in BSP	48 (1.88)	20 (0.79)	48 (1.89)	2 in thread	100.8 (3.96)	100.8 (3.96)	80 (3.15)

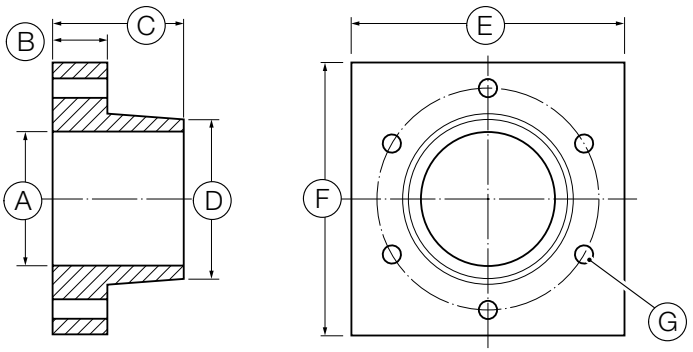


Figure 5 2 in NPT/BSP mounting adapter and dimensions

Flange type	A	B	C (Ø)	D
ABB standard flange mounting plate	160 (6.3)	160 (6.3)	7 (0.27)	16 (0.63)
Comprising: mounting plate, gasket, 6 each: M6/M10 shake-proof washers, plain washers and nuts				

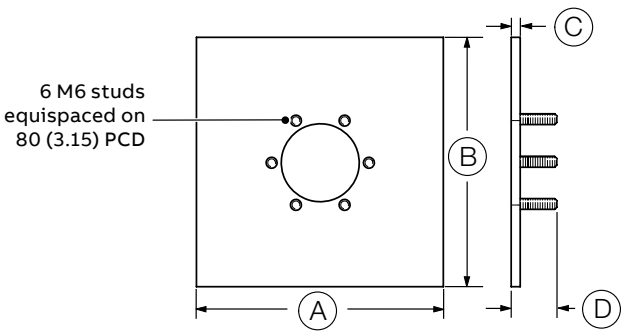


Figure 6 ABB standard mounting plate

6 Installation

6.1 General mounting requirements

NOTICE

- For optimum performance, mount the probe at 90° to the gas flow.
- The probe will function adequately in turbulent gas flows.
- Do not obstruct the flue gas exit hole.

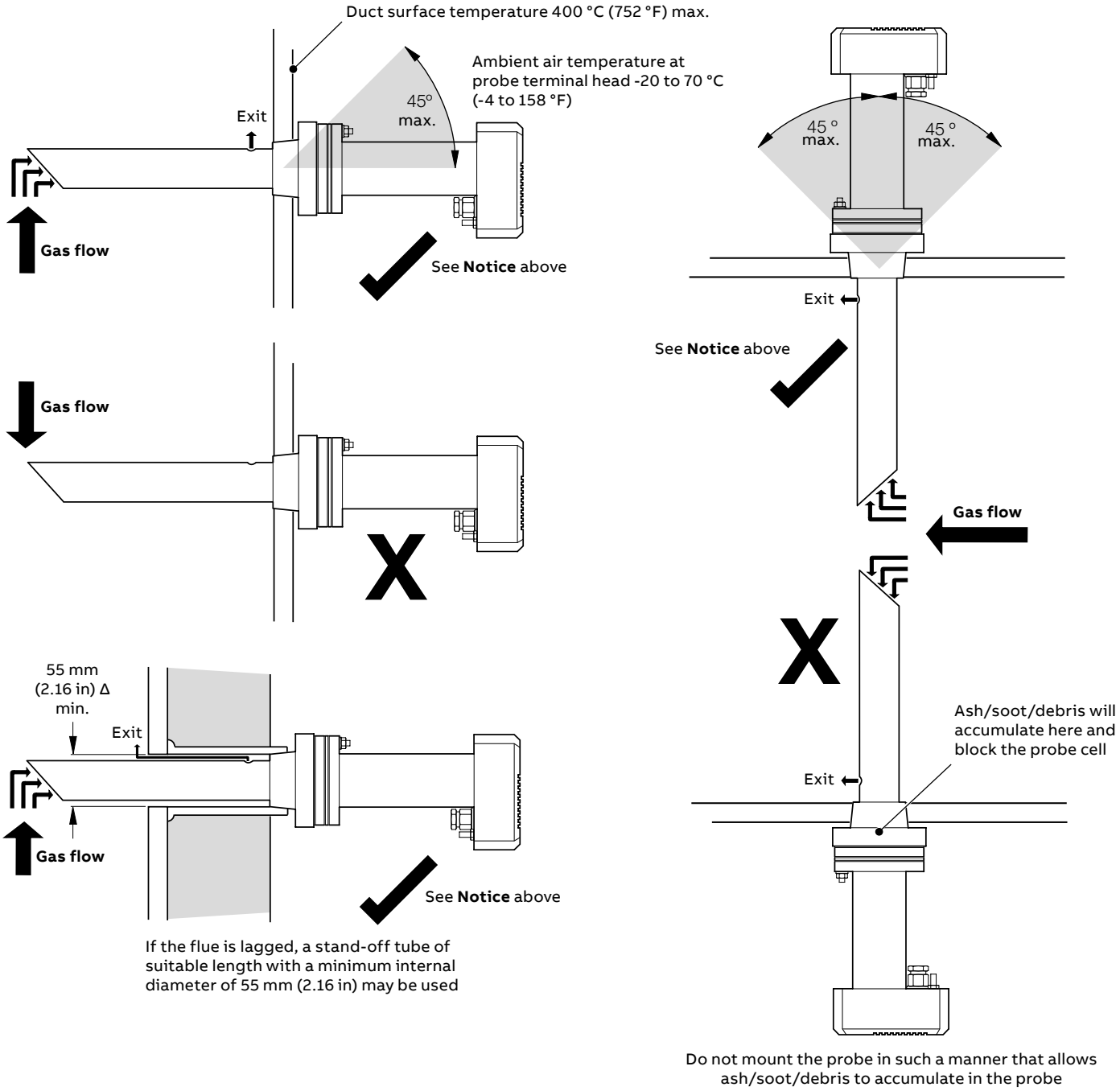


Figure 7 General mounting requirements

6.2 Threaded NPT and BSP mountings

⚠ WARNING

Failure to observe this warning will result in serious injury.

Before fitting the probe, ensure that the boiler is off and the flue is cool enough to touch.

If hot process gases are flowing through the flue when the probe intake tube is inserted, it will direct those gases toward the operator.

Notes

- The probe can be supplied with either a 2 in NPT or a 2 in BSP mounting option.
- The gasket joints must be gas tight otherwise errors in the O_2 readings will occur.

Referring to Figure 8:

1 Cut a 75 mm (2.95 in) minimum diameter hole (A) in the flue wall.

2 Weld a 2 in NPT or 2 in BSP female threaded boss (B) (not supplied) into place, concentric with the hole in the flue.

3 Apply high temperature jointing compound to the threads (C) of the probe mount adapter and screw the adapter into the boss.

4 Locate a gasket (D) over the studs on the adapter – see **Notes**, left.

5 Insert the probe intake tube (E) through the adapter, ensuring that the open side of the intake tube tip faces into the gas flow – see Figure 7, page 10 and **Warning** (left).

6 Align the bolt holes (F) in the probe intake tube flange with the studs on the adapter ensuring that the open side of the intake tube tip continues to face into the gas flow.

An arrow (G) is stamped on the tube flange to assist with orientation.

7 Locate a gasket (H) over the studs on the adapter – see **Notes**, left.

8 Fit the probe body (I) over the studs on the adapter ensuring Company name is uppermost.

9 Secure the probe and gasket using six M6 nuts and washers (J).

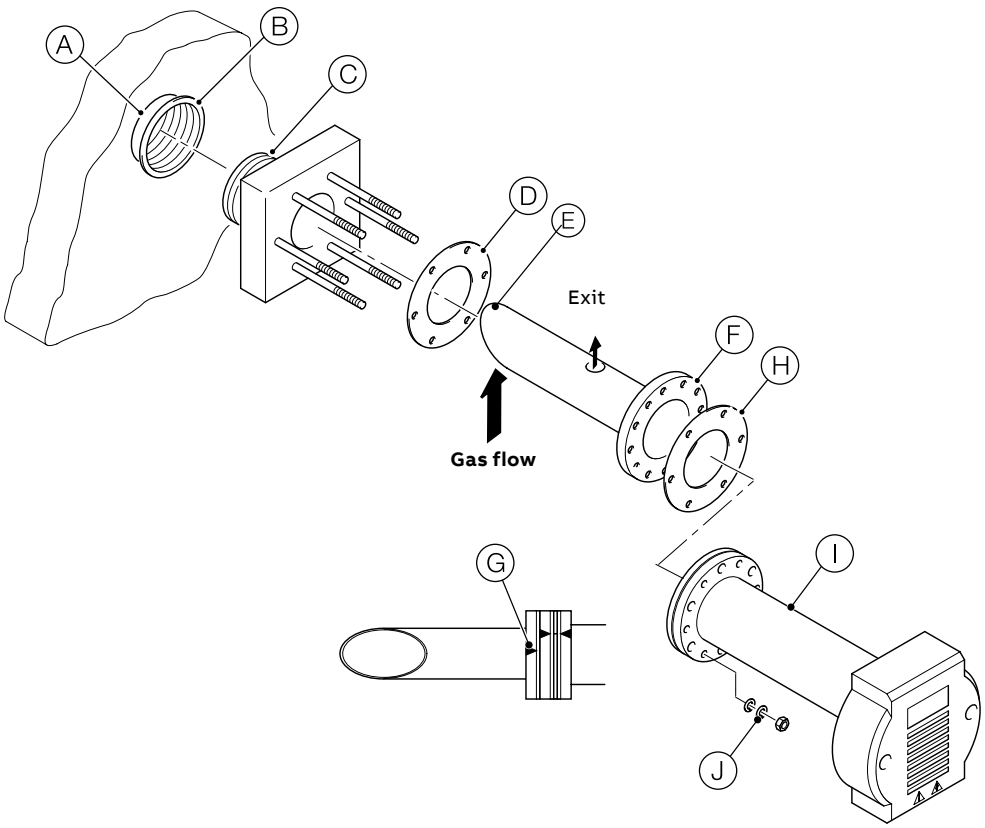


Figure 8 Standard (2 in NPT) and optional (2 in BSP) mountings

...6 Installation

6.3 ABB standard flange mounting plate

⚠ WARNING

Failure to observe this warning will result in serious injury.

Before fitting the probe, ensure that the boiler is off and the flue is cool enough to touch.

If hot process gases are flowing through the flue when the probe intake tube is inserted, it will direct those gases toward the operator.

Note. The gasket joints must be gas tight otherwise errors in the O_2 readings will occur.

Referring to Figure 9, page 13:

1 Cut a 75 mm (2.95 in) minimum diameter hole (A) in the flue wall (B).

2 Weld a mounting plate AZ1000098 (C) into place, concentric with the hole in the flue.

3 Locate a gasket (D) over the studs on the adapter – see **Note**, left.

4 Insert the probe intake tube (E) through the adapter, ensuring that the open side of the intake tube tip faces into the gas flow – see Figure 7, page 10 and **Warning** (left).

5 Align the bolt holes (F) in the probe intake tube flange with the studs on the adapter ensuring that the open side of the intake tube tip continues to face into the gas flow.

An arrow (G) is stamped on the tube flange to assist with orientation.

6 Locate a gasket (H) over the studs on the adapter – see **Notes**, page 11.

7 Fit the probe body (I) over the studs on the adapter ensuring Company name is uppermost.

8 Secure the probe and gasket using six M6 nuts and washers (J).

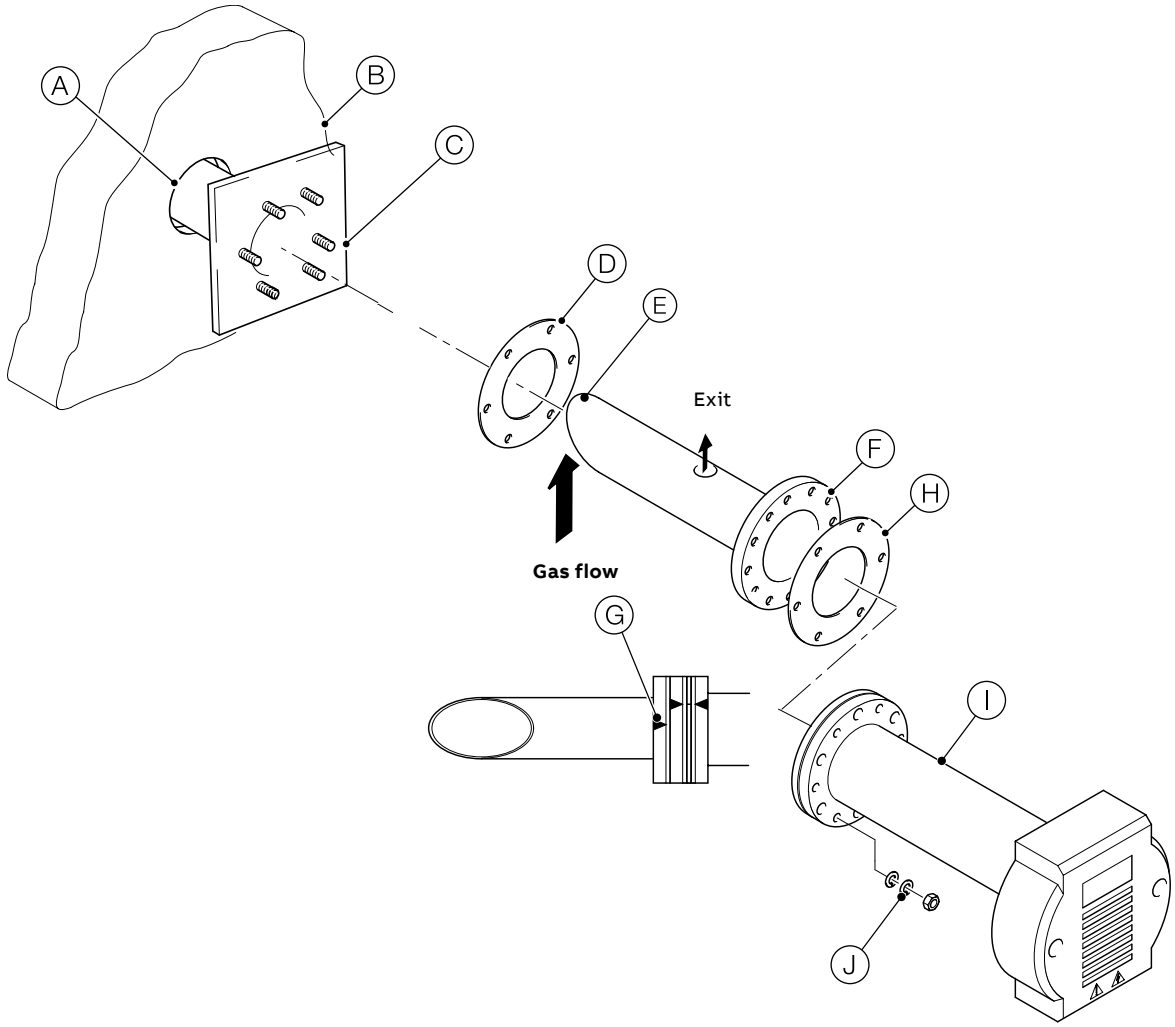


Figure 9 ABB standard flange mounting plate

...6 Installation

6.4 Flange-mounted installations

⚠ WARNING

Failure to observe this warning will result in serious injury.

Before fitting the probe, ensure that the boiler is off and the flue is cool enough to touch.

If hot process gases are flowing through the flue when the probe intake tube is inserted, it will direct those gases toward the operator.

Notes

- This procedure is for AZ10 probes mounted to customer-supplied/installed flanges – see page 11 for threaded NPT/BSP installations.
- The gasket joints must be gas tight otherwise errors in the O_2 readings will occur.

Referring to Figure 10:

1. Fit a suitable mating flange (customer-supplied) (A) to the flue wall.
2. Secure flange (B) to the flue-mounted mating flange (A) using suitable fixings (C) (not-supplied).
3. Locate a gasket (D) over the studs on flanged boss (B) – see **Notes**, left.
4. Insert the probe intake tube (E) through the adapter, ensuring that the open side of the intake tube tip faces into the gas flow – see Figure 7, page 10 and **Warning** (left).
5. Align the bolt holes (F) in the probe intake tube flange with the studs on the adapter ensuring that the open side of the intake tube tip continues to face into the gas flow.

   An arrow (G) is stamped on the tube flange to assist with orientation.
6. Locate a gasket (H) over the studs on the adapter – see **Notes**, left.
7. Fit the probe body (I) over the studs on the adapter ensuring Company name is uppermost.
8. Secure the probe and gasket using six M6 nuts and washers (J).

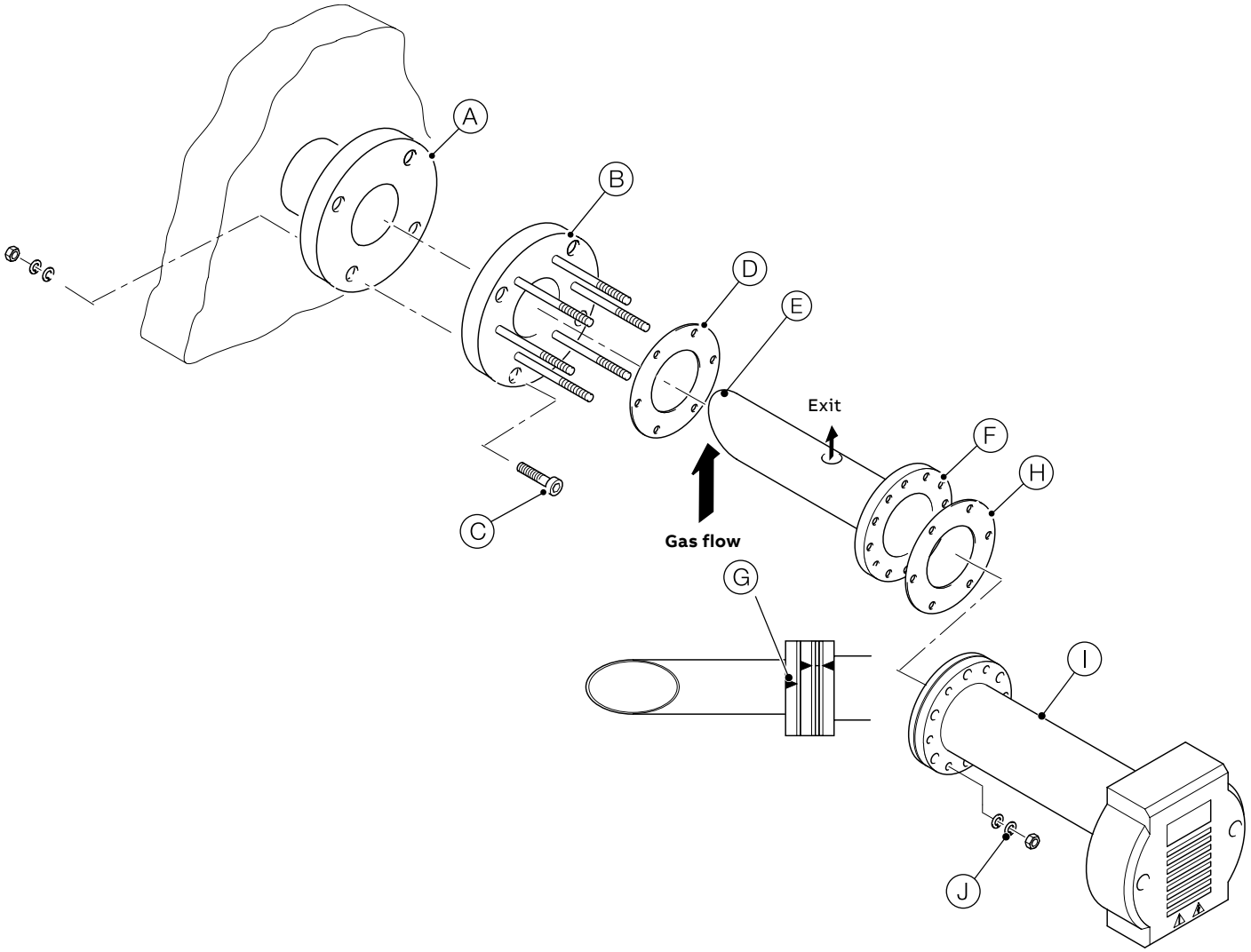


Figure 10 Flange-mounted installations

7 Electrical connections

⚠ WARNING

Bodily injury.

- The transmitter is not fitted with a switch therefore a disconnecting device such as a switch or circuit breaker conforming to local safety standards must be fitted to the final installation. It must be fitted in close proximity to the instrument within easy reach of the operator and must be marked clearly as the disconnection device for the transmitter.
- The probe must be bonded to local earth using the external earth connection – see Figure 11.
- Electrical installation and earthing (grounding) must be in accordance with relevant national and local standards.
- Remove all power from supply, relay and any powered control circuits and high common mode voltages before accessing or making any connections.
- The AZ10 cable carries the screened signal wires and the separately screened 90 to 264 V AC heater wires safely. Do not use alternative wires.
- The equipment conforms to Installation Category II of IEC 61010.
- All connections to secondary circuits must have basic insulation.
- After installation, there must be no access to live parts, for example, terminals.
- Terminals for external circuits are for use only with equipment with no accessible live parts.
- If the equipment is used in a manner not specified by the Company, the protection provided by the equipment may be impaired.
- All equipment connected to the transmitter's terminals must comply with local safety standards (IEC 60950, EN601010-1).

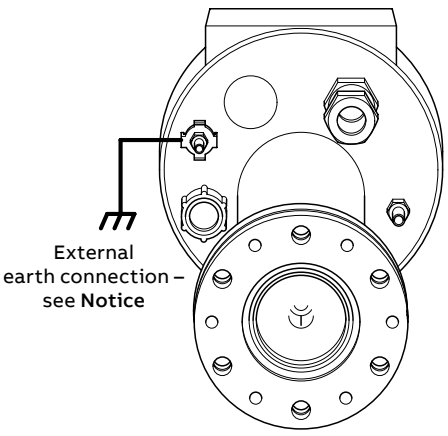


Figure 11 External earth connection

NOTICE

Earth bonding between the probe and transmitter is required to ensure effective EMC compliance. Min. 4mm² cable should be used.

⚠ CAUTION

- Make connections only as shown.
- Maintain Environmental Protection at all times.
- Ensure the seal and mating surfaces are clean to maintain environmental rating.
- Ensure cable glands are tightened after wiring.

7.1 Cable entries

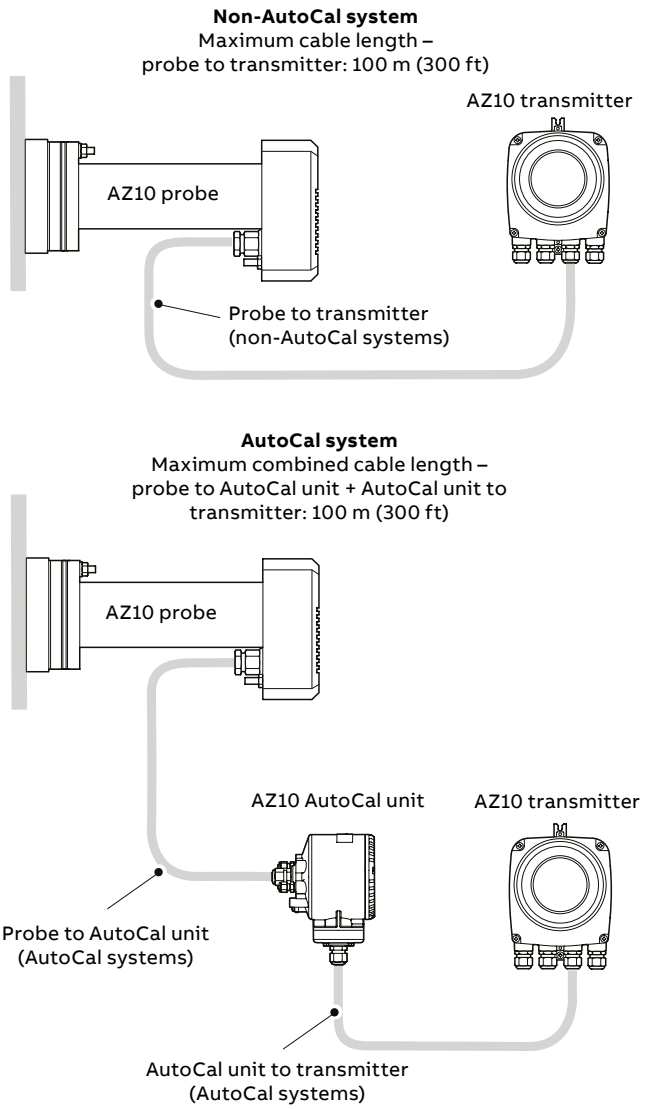


Figure 12 Cable entries

7.2 Probe connections, general

⚠ WARNING

Bodily injury.

- Before making any connections, ensure that the power supply, any high voltage-operated control circuits and high common mode voltages are switched off.

Perform the procedures detailed below.
A 4 mm earth bonding point is provided on the back of the probe head – see Figure 11.

7.2.1 Access to probe terminals

Referring to Figure 13:

1 Release 2 captive screws (A) securing terminal cover (B) and remove the terminal cover.

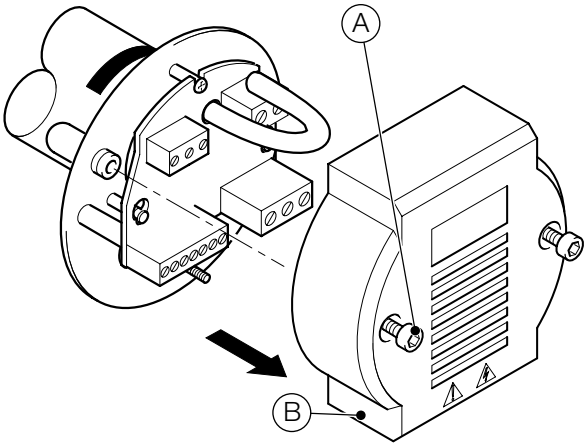


Figure 13 Removing probe terminal cover

7.2.2 Preparing the cable(s)

The cable(s) must be prepared to suit the non-AutoCal/AutoCal systems before connections can be made.

Cable requirements:

- one length of 14-core cable is required to connect non-AutoCal systems (probe to transmitter) – maximum length 100 m (300 ft).
- two lengths of 14-core cable are required to connect AutoCal systems (probe to AutoCal unit and AutoCal unit to transmitter) – maximum **combined** length 100 m (300 ft).

Refer to the following pages for connection requirements:

- page 19 for non-AutoCal systems (probe to transmitter)
- page 21 and page 22 for AutoCal systems (probe to AutoCal unit and AutoCal unit to transmitter)

7.3 Cable glands

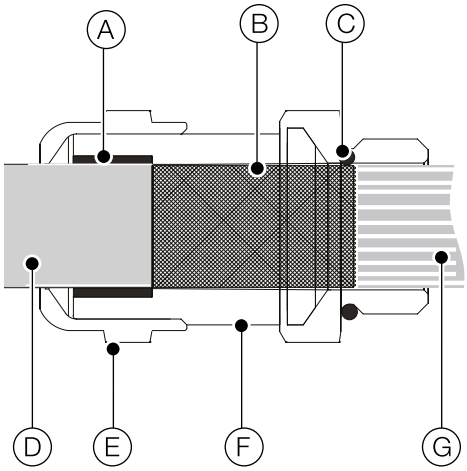
NOTICE

The special EMC cable gland supplied with the probe/transmitter can be replaced by any ½ in NPT or ½ in BSP, EMC metal gland that forms a watertight seal on the outer sheath of the cable and an electrical contact to the braided copper shield.

The gland must form a good electrical contact with the probe for grounding purposes and form a NEMA 4X watertight seal with the probe – see Figure 10, page 14.

7.3.1 EMC cable gland

Locate cable glands before preparing cable.



(A) Rubber environmental seal

(B) Braided copper cable shield (shield 2 braid – see Figure 15, page 18)

(C) Gland O-ring – NEMA 4X seal

(D) Cable sheath (see Figure 15, page 18)

(E) Gland outer nut

(F) Gland clamping sleeve

(G) Cable wires to terminals (see Figure 15, page 18)

Figure 14 EMC Cable gland shown fitted to cable

...7 Electrical connections

7.4 Non-AutoCal systems

⚠ WARNING

Bodily injury.

- The 14-core AZ10 cable carries the screened signal wires and the separately screened 90 to 264 V AC heater control wires safely.
- Before preparing cable wires, refer to Table 1, page 19 to identify unused AutoCal wires that must be cut back for non-AutoCal systems.

7.4.1 Cable preparation

Referring to Figure 15:

1 Before preparing cable ends, slide a cable gland onto each end of the cable in the correct orientation.

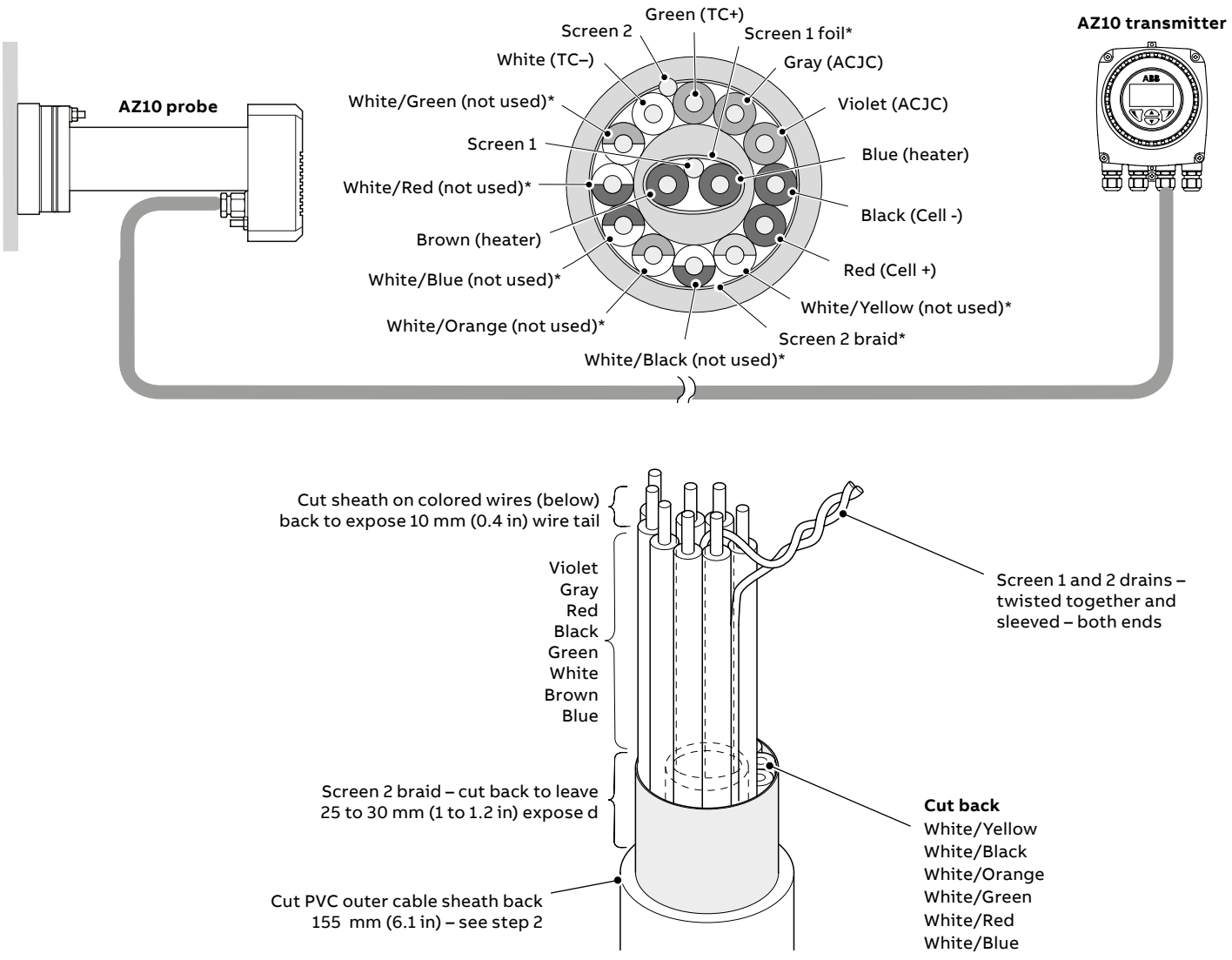
2 Cut back the PVC outer sheaths by 155 mm (6.1 in).

3 Cut back Screen 2 braid leaving 25 to 30 mm (1 to 1.2 in) exposed. Do not cut back Screen 2 drain wire.

4 Cut back the PVC outer sheath of the 2 heater cores (brown and blue) and Screen 1 foil by 90 to 95 mm (3.7 in approx.). Do not cut back Screen 1 drain wire.

5 Twist Screen 1 and Screen 2 (drain) wires together to form a twisted pair at each end of the cable and fit a 40 mm (1.57 in) earth sleeve (not supplied) over each twisted pair.

6 Cut back all unused wires as instructed in Table 1, page 19 and cut the insulation back on each the remaining wires to expose 10 mm (0.4 in) of wire tail.



*Cut back

Figure 15 Cable preparation – non-AutoCal systems (both ends)/AZ10 probe to AZ10 transmitter

7.4.2 Electrical connections

Table 1 Cable requirements – non-AutoCal systems/AZ10 probe to AZ10 transmitter

Wire color	Transmitter connection/ terminal color	Probe terminal	Connection type
Brown	Blue (1)	H1	Heater 1
Blue	Brown (2)	H2	Heater 2
Screen 1 and 2 (drains) – connect to probe internal earth stud and connect an internal earth wire from probe earth terminal to **probe internal earth stud at probe**	SCN (**NOT USED)** Screen 1 and 2 (drains) connected to **transmitter internal earth stud only**	Internal earth stud (symbol)	Screen 1 and 2 (drain wires) – connect at probe earth stud and transmitter earth stud **only**
White	White	TC-	T/C -
Green	Green	TC+	T/C +
Gray	Gray	ACJC	ACJC
Violet	Violet	ACJC	ACJC
Black	Black	Cell –	Cell – (oxygen input)
Red	Red	Cell +	Cell + (oxygen input)
White/Yellow (cut wires back both ends) White/Black (cut wires back both ends) White/Orange (cut wires back both ends) White/Green (cut wires back both ends) White/Red (cut wires back both ends) White/Blue (cut wires back both ends)	White/Yellow White/Black White/Orange White/Green White/Red White/Blue	Not fitted	Not applicable

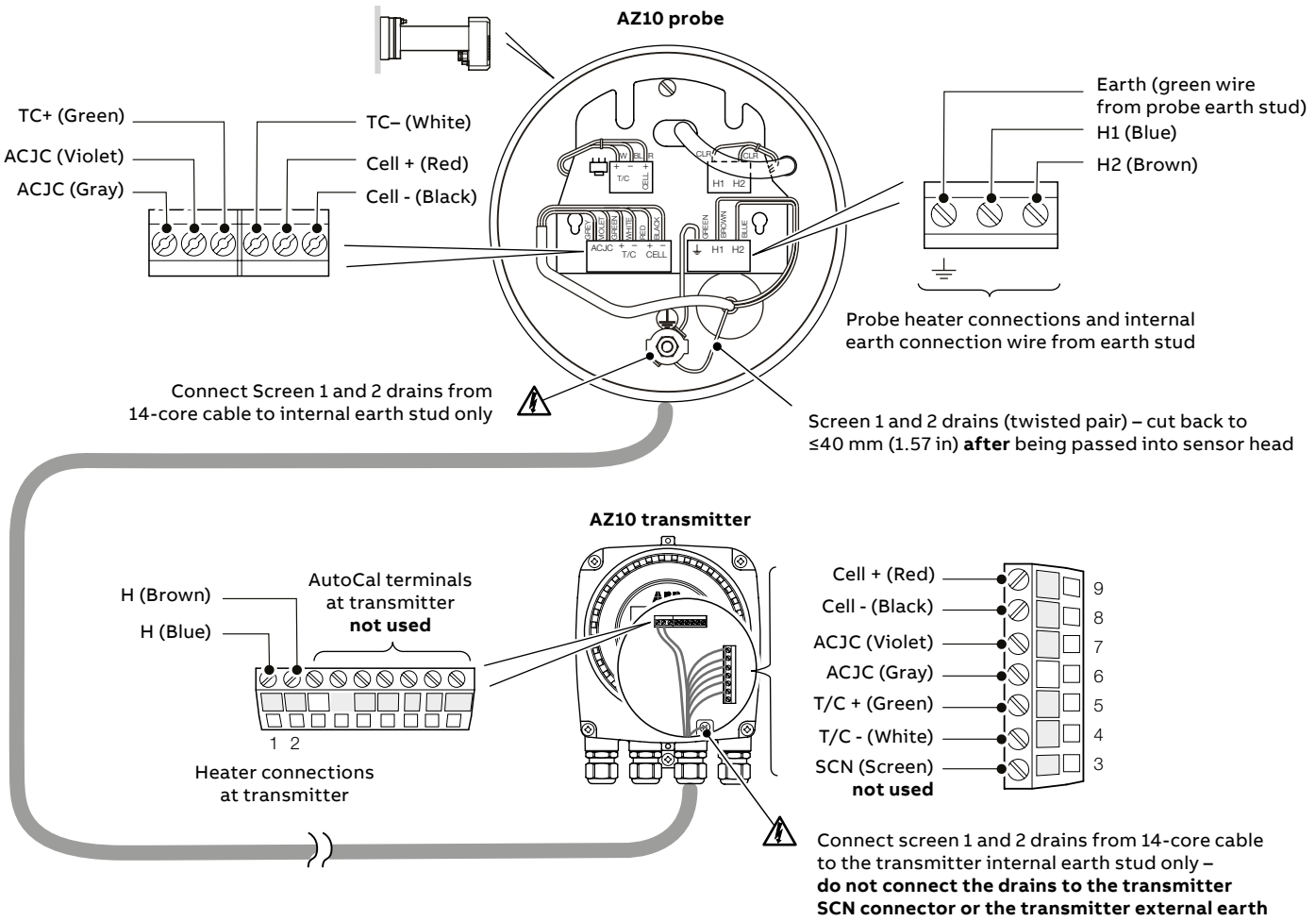


Figure 16 Electrical connections – AZ10 probe to AZ10 transmitter (non-AutoCal systems)

...7 Electrical connections

7.5 AutoCal systems (both ends)/AZ10 probe to AZ10 AutoCal unit

⚠ WARNING

Bodily injury.

- The 14-core AZ10 cable carries the screened signal wires and the separately screened 90 to 264 V AC heater control wires safely.
- Before preparing cable wires, refer to Table 2, page 21 to identify unused wires that must be cut back for AutoCal systems.

7.5.1 Cable preparation

Referring to Figure 17:

1 Before preparing cable ends, slide a cable gland onto each end of the cable in the correct orientation.

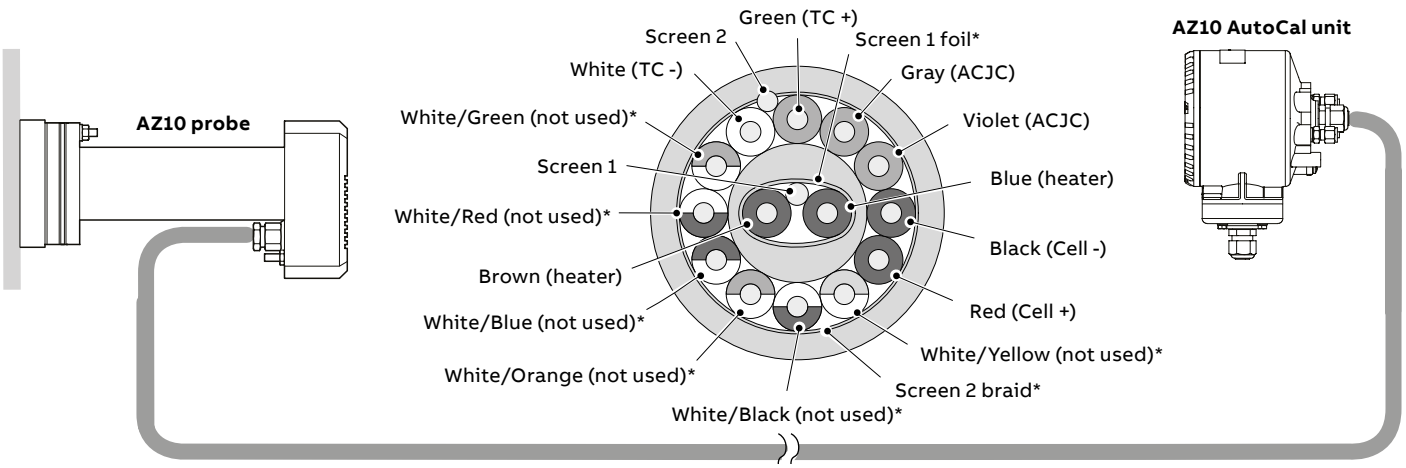
2 Cut back the PVC outer sheaths by 155 mm (6.1 in).

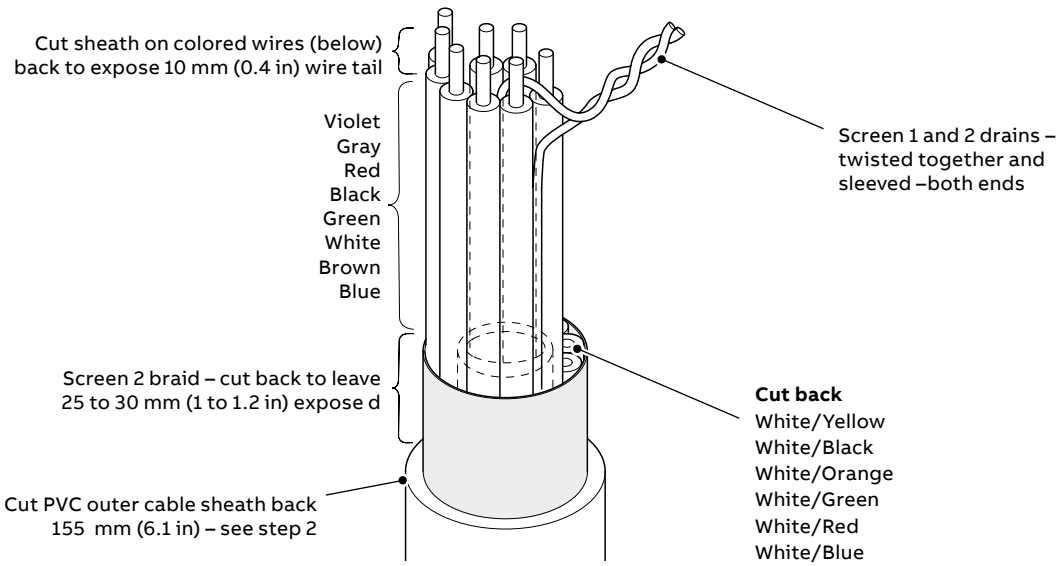
3 Cut back Screen 2 braid leaving 25 to 30 mm (1 to 1.2 in) exposed. Do not cut back Screen 2 drain wire.

4 Cut back the PVC outer sheath of the 2 heater cores (brown and blue) and Screen 1 foil by 90 to 95 mm (3.7 in approx.). Do not cut back Screen 1 drain wire.

5 Twist Screen 1 and Screen 2 (drain) wires together to form a twisted pair at each end of the cable and fit a 40 mm (1.57 in) earth sleeve (not supplied) over each twisted pair.

6 Cut back all unused wires as instructed in Table 2, page 21 and cut the insulation back on each the remaining wires to expose 10 mm (0.4 in) of wire tail.





*Cut back

Figure 17 Cable preparation – AutoCal systems (both ends)/AZ10 probe to AZ10 AutoCal unit

7.5.2 Electrical connections

Table 2 Cable requirements – AutoCal systems/AZ10 probe to AZ10 AutoCal unit

Wire color	AutoCal unit connection/ terminal color	Probe terminal	Connection type
Blue	Blue	H1	Heater 1
Brown	Brown	H2	Heater 2
Screen 1 and 2 (drains) – connect to probe internal earth stud and connect an internal earth wire from probe earth terminal to **probe internal earth stud at probe**	SCN Screen 1 and 2 (drains)	Internal earth stud	Screen 1 and 2 (drain wires) – connect to probe earth stud and AutoCal unit SCN terminal
White	White	White	T/C -
Green	Green	Green	T/C +
Gray	Gray	Gray	ACJC
Violet	Violet	Violet	ACJC
Black	Black	Black	Cell - (oxygen input)
Red	Red	Red	Cell + (oxygen input)
White/Yellow (cut wire back both ends) White/Black (cut wire back both ends) White/Orange (cut wire back both ends) White/Green (cut wire back both ends) White/Red (cut wire back both ends) White/Blue (cut wire back both ends)	White/Yellow White/Black White/Orange White/Green White/Red White/Blue	N/A	Not used

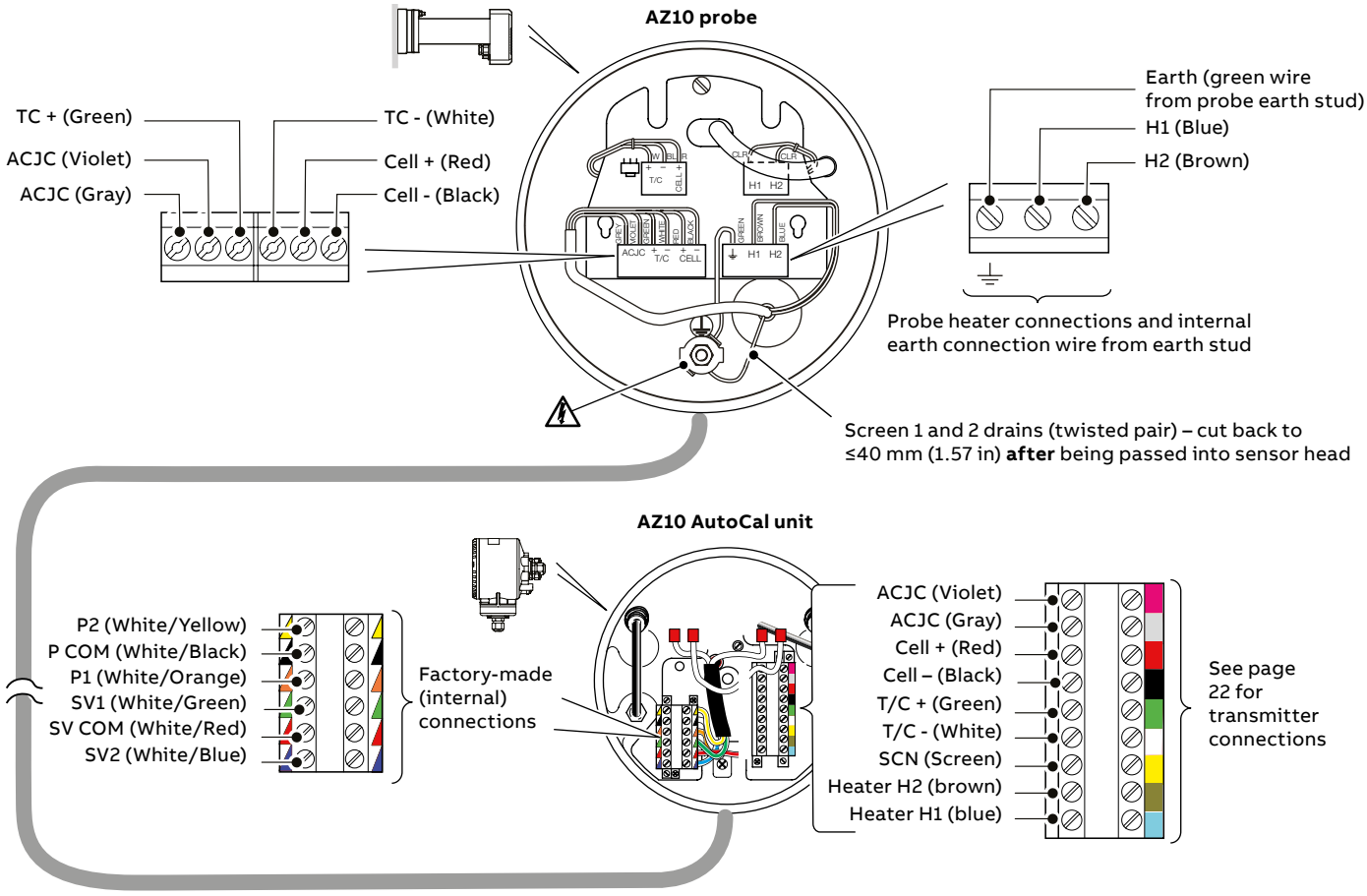


Figure 18 Electrical connections – AZ10 probe to AZ10 AutoCal unit (AutoCal systems)

...7 Electrical connections

7.6 AutoCal systems (both ends)/AZ10 AutoCal unit to transmitter

⚠ WARNING

Bodily injury.

- The 14-core AZ10 cable carries the screened signal wires and the separately screened 90 to 264 V AC heater control wires safely.

7.6.1 Cable preparation

Referring to Figure 19:

1 Before preparing cable ends, slide a cable gland onto each end of the cable in the correct orientation.

2 Cut back the PVC outer sheaths by 155 mm (6.1 in).

3 Cut back Screen 2 braid leaving 25 to 30 mm (1 to 1.2 in) exposed. Do not cut back Screen 2 drain wire.

4 Cut back the PVC outer sheath of the 2 heater cores (brown and blue) and Screen 1 foil by 90 to 95 mm (3.5 to 3.7 in approx.).
Do not cut back Screen 1 drain wire.

5 Twist Screen 1 and Screen 2 (drain) wires together to form a twisted pair at each end of the cable and fit a 40 mm (1.57 in) earth sleeve (not supplied) over each twisted pair.

6 Cut the insulation back on each of the remaining wires to expose 10 mm (0.4in) of wire tail.

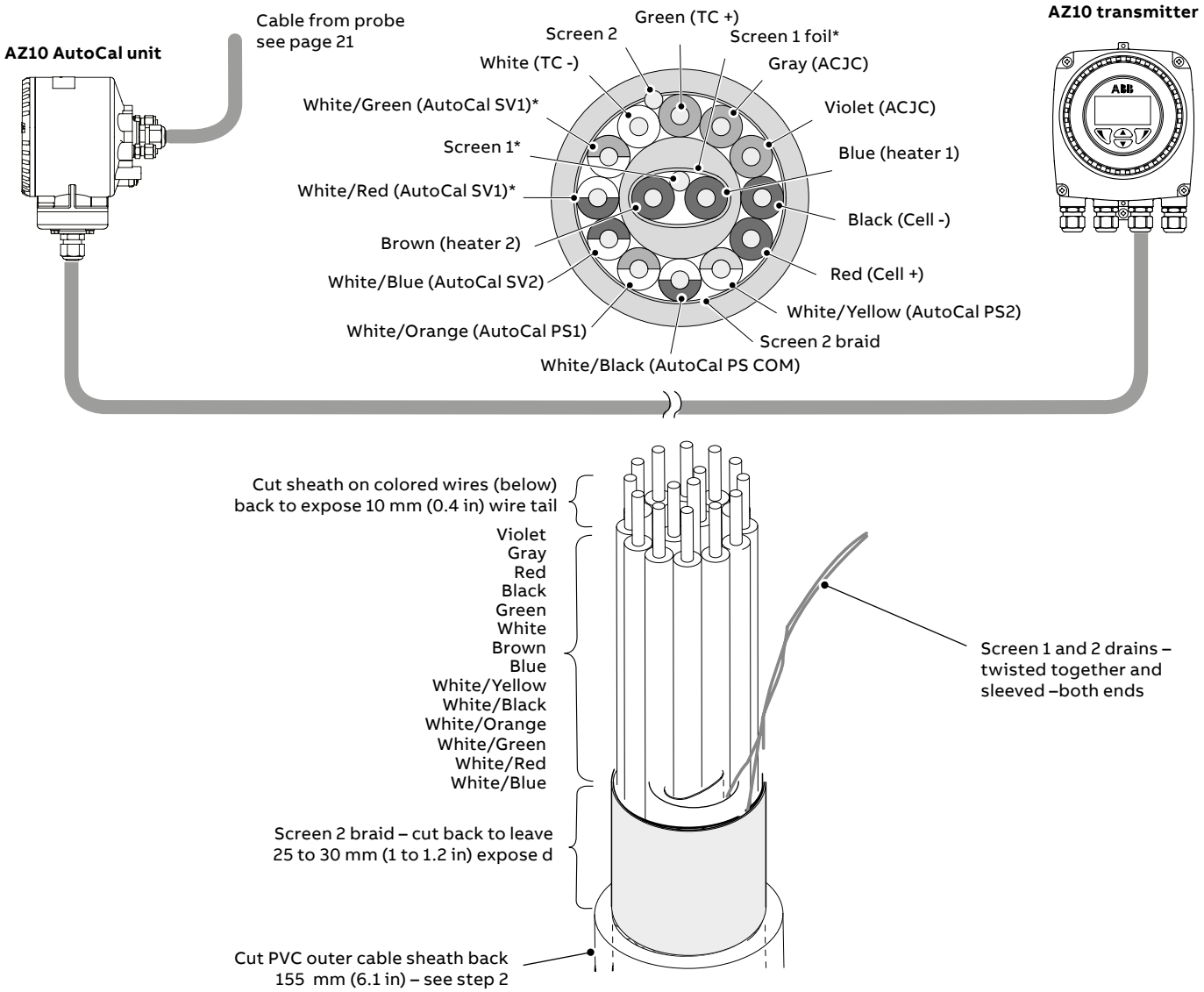


Figure 19 Cable preparation – AutoCal systems (both ends)/AZ10 AutoCal unit to AZ10 transmitter

7.6.2 Electrical connections

Table 3 Cable requirements – AZ10 AutoCal unit to AZ10 transmitter (AutoCal systems)

Wire color	AutoCal unit connection/ terminal color	Transmitter connection/ terminal color	Connection type
Blue	Blue	Blue	Heater 1
Brown	Brown	Brown	Heater 2
Screen 1 and 2 (drains) – connect to transmitter internal earth stud and AutoCal unit SCN terminal	SCN Screen 1 and 2 (drains)	SCN Screen 1 and 2 (drains)	Screen 1 and 2 (drain wires) – connect to transmitter earth stud and AutoCal unit SCN terminal
White	White	White	T/C -
Green	Green	Green	T/C +
Gray	Gray	Gray	ACJC
Violet	Violet	Violet	ACJC
Black	Black	Black	Cell - (oxygen input)
Red	Red	Red	Cell + (oxygen input)
White/Yellow	White/Yellow	White/Yellow	PS2 (test gas 2)
White/Black	White/Black	White/Black	P Comm
White/Orange	White/Orange	White/Orange	PS1 (test gas 1)
White/Green	White/Green	White/Green	SV2
White/Red	White/Red	White/Red	SV Comm
White/Blue	White/Blue	White/Blue	SV1

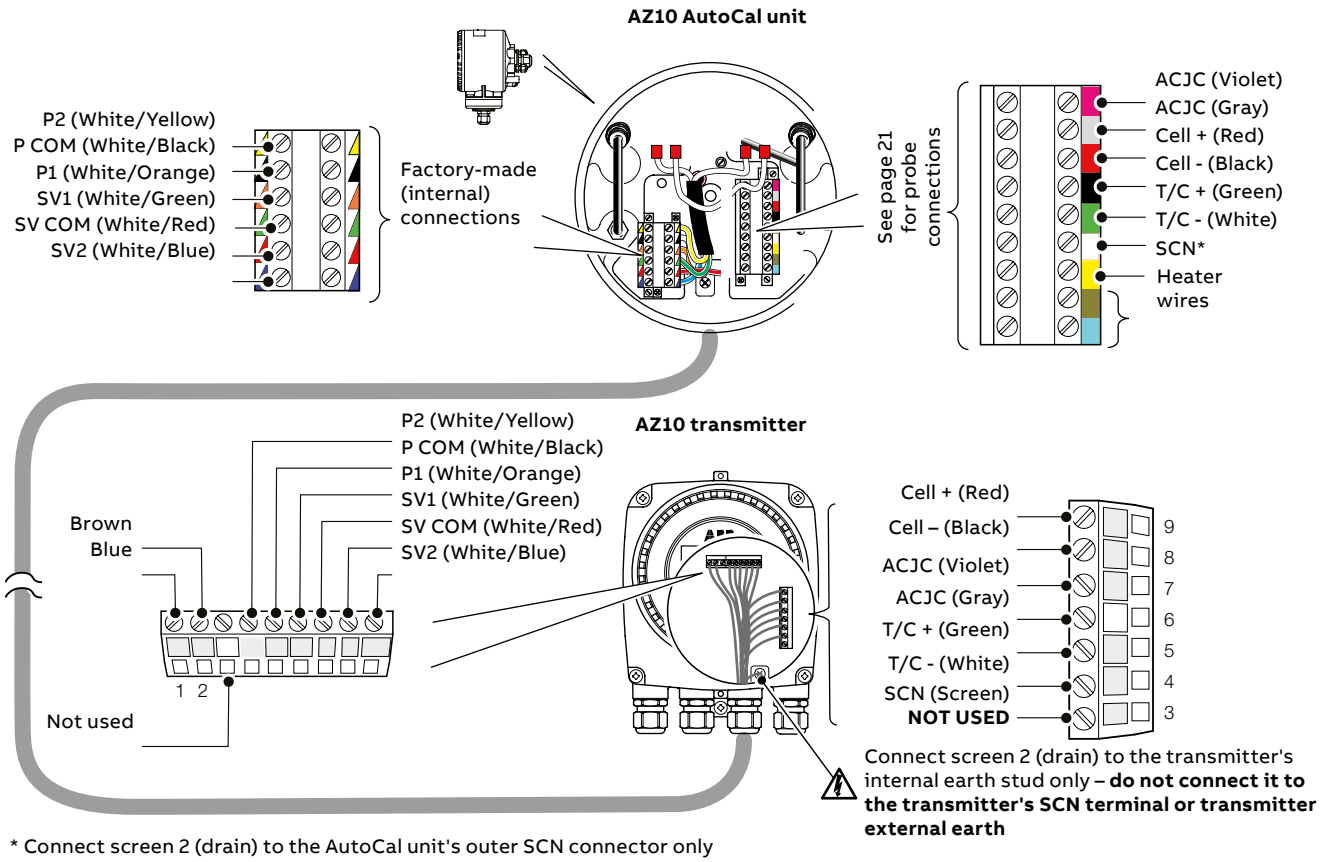


Figure 20 Electrical connections – AutoCal systems/AZ10 AutoCal unit to AZ10 transmitter

...7 Electrical connections

7.7 Probe connections

The probe head accepts two cables for separate routing of signal and power cables, both must be rated to -10 to 80 °C (14 to 176 °F) and have an outside diameter of between 5 and 9 mm (0.2 to 0.35 in). The system can be supplied with 10, 25, 50 or 100 m of 6-way copper conductor cable for connecting the probe and electronics unit. Power cable is not supplied.

Connect the probe, ensuring the cables are routed as shown in Figure 21.

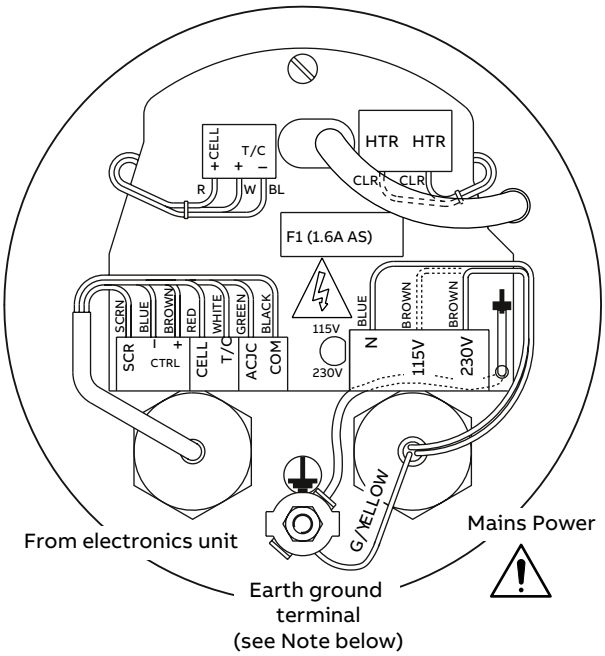


Figure 21 Probe connections

⚠ WARNING

Ensure the mains supply live (line) cable is connected to the correct terminal according to the supply voltage (115 or 230V).

NOTICE

For correct operation, the mains and the PCB earth (ground) cables must be connected to the earth (ground) terminal as shown.

Note. The cable glands supplied with the probe may be replaced by any ½ in NPT cable entry gland that is certified to 80 °C and classed as watertight.
If the glanded entries supplied are changed for any alternative fittings use the 2 packing/sealing rings from the existing glands to ensure correct sealing/alignment.

8 Electrical connections for AZ10 probes backward-compatible with AZ100 systems

8.1 Probe connections, general

⚠ WARNING

Before making any connections, ensure that the power supply, any high voltage-operated control circuits and high common mode voltages are switched off.

Carry out the procedures detailed in sections 8.1.1 and 8.1.2. A 4 mm earth bonding point is provided on the back of the probe head – see Figure 22.

8.1.1 Access to probe terminals

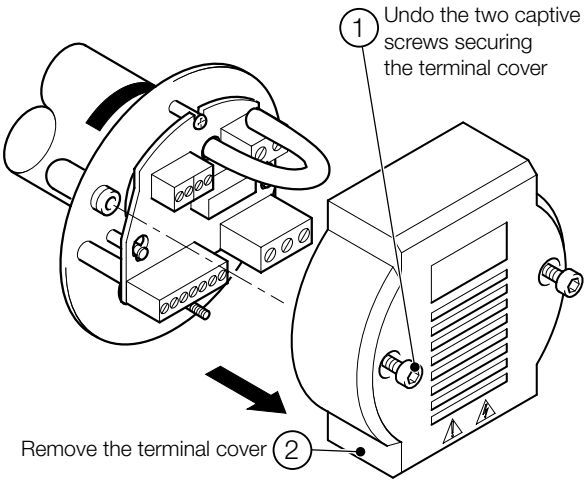


Figure 22 Access to probe terminals

8.1.2 Probe connections

The probe head accepts two cables for separate routing of signal and power cables, both must be rated to -10 to 80 °C (14 to 176 °F) and have an outside diameter of between 5 and 9 mm (0.2 to 0.35 in). The system can be supplied with 10, 25, 50 or 100 m of 6-way copper conductor cable for connecting the probe and electronics unit. Power cable is not supplied. Connect the probe, ensuring the cables are routed as shown in Figure 23.

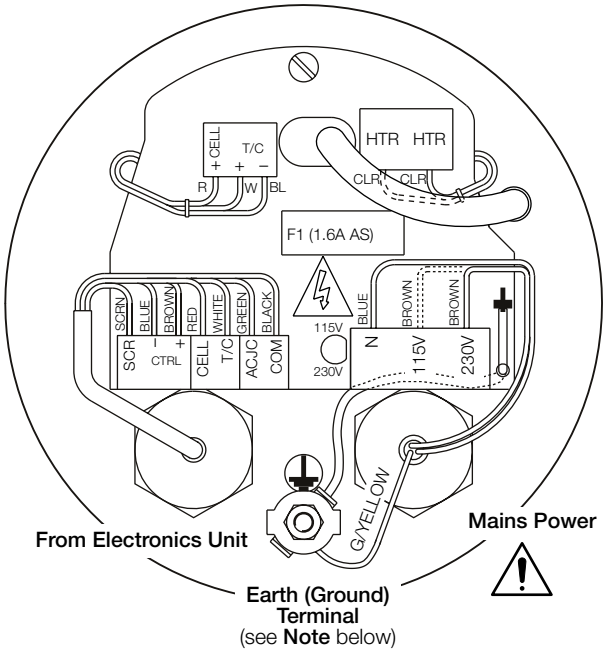


Figure 23 Probe connections

⚠ WARNING

Ensure the mains supply live (line) cable is connected to the correct terminal according to the supply voltage (115 or 230V).

Note.
For correct operation, the mains and the PCB earth (ground) cables must be connected to the earth (ground) terminal as shown.

Note.
The cable glands supplied with the probe may be replaced by any ½ in NPT cable entry gland that is certified to 80 °C and classed as watertight.
If the glanded entries supplied are changed for any alternative fittings use the 2 packing/sealing rings from the existing glands to ensure correct sealing/alignment.

…8 Electrical connections for AZ10 probes backward-compatible with AZ100 systems

8.2 Access to terminals

8.2.1 Wall-/pipe-mounted units

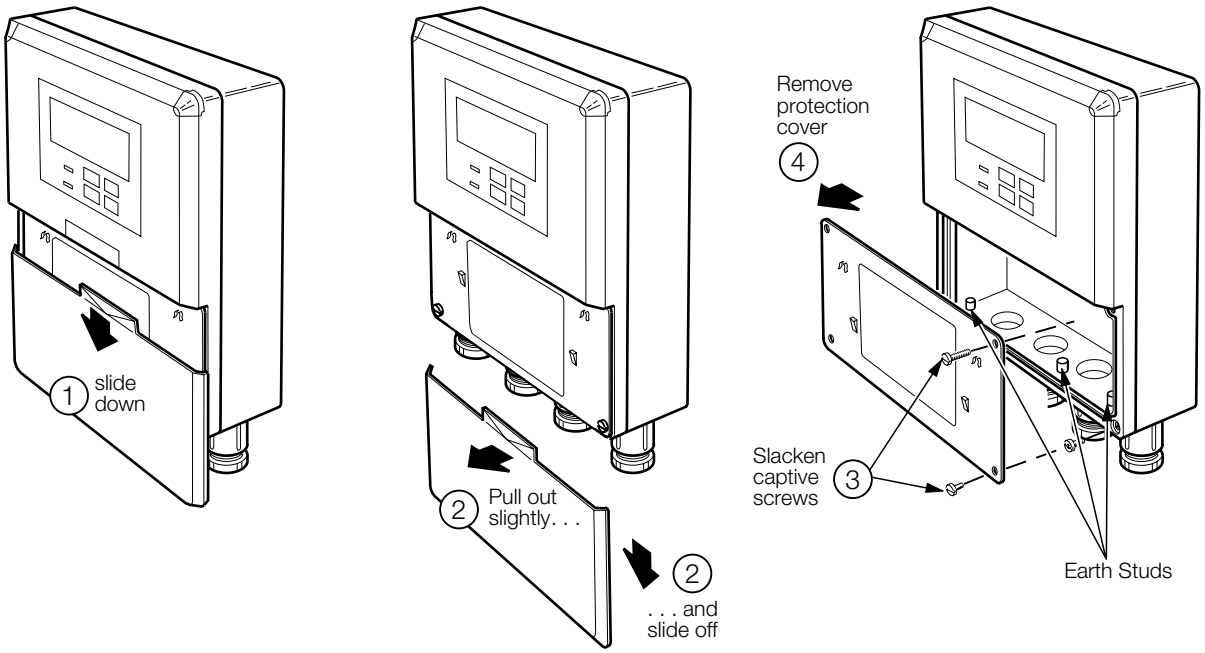


Figure 24 Access to terminals – Wall-/pipe-mounted instruments

8.2.2 Panel-mounted units

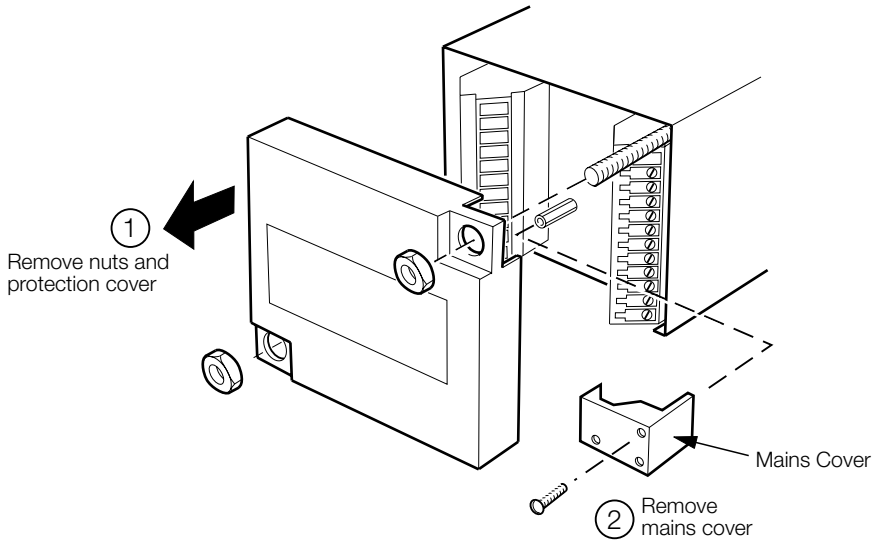


Figure 25 Access to terminals – Panel-mounted instruments

8.3 Selecting the mains voltage

8.3.1 Wall-/pipe-mounted units

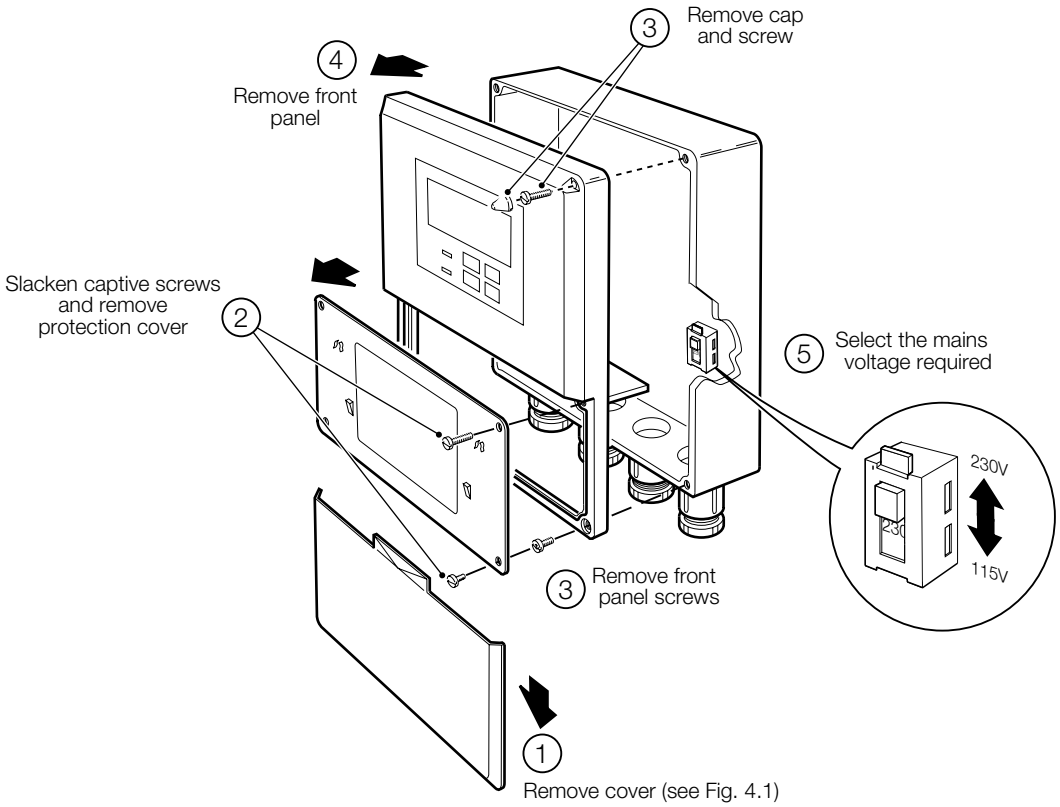


Figure 26 Selecting the mains voltage – Wall-/pipe-mounted instruments

8.3.2 Panel-mounted units

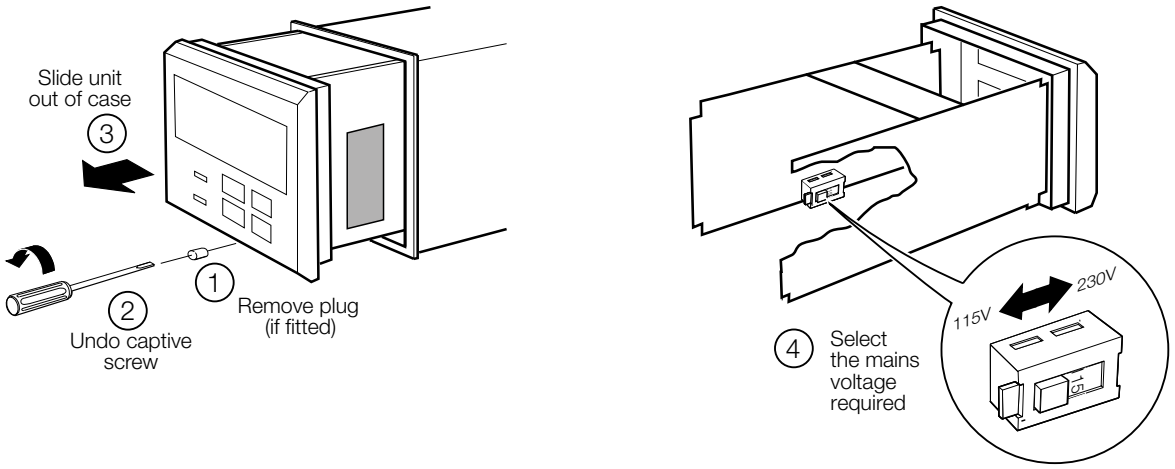


Figure 27 Selecting the mains voltage – panel-mounted instruments

…8 Electrical connections for AZ10 probes backward-compatible with AZ100 systems

8.4 Connections, general

Notes.

- Earthing (grounding) – stud terminal(s) is fitted to the transmitter case for bus-bar earth (ground) connection.
- Cable routing – always route signal output/O_2 probe signal cable and mains-carrying/relay cables separately, ideally in earthed metal conduit. Use twisted pair output leads or use screened cable with the screen connected to the case earth stud.
  Ensure that the cables enter the transmitter through the glands nearest the appropriate screw terminals and are short and direct. Do not tuck excess cable into the terminal compartment.
- Cable glands & conduit fittings – ensure a moisture-tight fit when using cable glands, conduit fittings and blanking plugs/bungs (M20 holes). The M16 glands ready-fitted to wall-mounted instruments accept cable of between 4 and 7 mm diameter.
- Relays –the relay contacts are voltage-free and must be appropriately connected in series with the power supply and the alarm/control device which they are to actuate. Ensure that the contact rating is not exceeded. Refer also to “Relay contact protection and interference suppression” for relay contact protection details when the relays are to be used for switching loads.
- Retransmission output – Do not exceed the maximum load specification for the selected current retransmission range – see Data Sheet (DS/AZ100).
  Since the retransmission output is isolated the –ve terminal must be connected to earth (ground) if connecting to the isolated input of another device.

8.4.1 Relay contact protection and interference suppression

If the relays are used to switch loads on and off, the relay contacts can become eroded due to arcing. Arcing also generates radio frequency interference (RFI) which can result in instrument malfunctions and incorrect readings. To minimize the effects of RFI, arc suppression components are required; resistor/capacitor networks for AC applications or diodes for DC applications. These components can be connected either across the load or directly across the relay contacts. On 4600 Series instruments the RFI components must be fitted to the relay terminal block along with the supply and load wires – see “Relay contact protection” on page 28.

For **AC applications** the value of the resistor/capacitor network depends on the load current and inductance that is switched. Initially, fit a 100R/0.022 µF RC suppressor unit (part no. B9303) as shown in part A of “Relay contact protection” on page 28. If the instrument malfunctions (incorrect readings) or resets (display shows 88888) the value of the RC network is too low for suppression and an alternative value must be used. If the correct value cannot be obtained, contact the manufacturer of the switched device for details on the RC unit required.

For **DC applications** fit a diode as shown in part B of “Relay contact protection” on page 28. For general applications use an IN5406 type (600 V peak inverse voltage at 3 A).

Note. For reliable switching, the minimum voltage must be greater than 12 V and the minimum current greater than 100 mA.

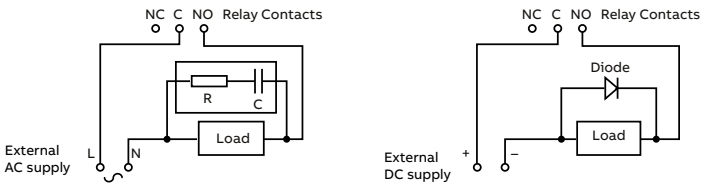
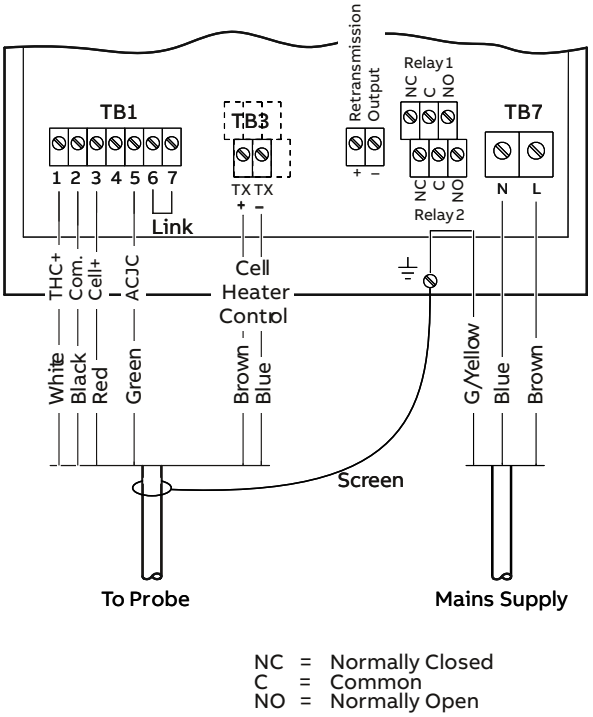


Figure 28 Relay contact protection

8.5 Connections, wall-/pipe-mounted units

Note. Slacken terminal screws fully before making connections.

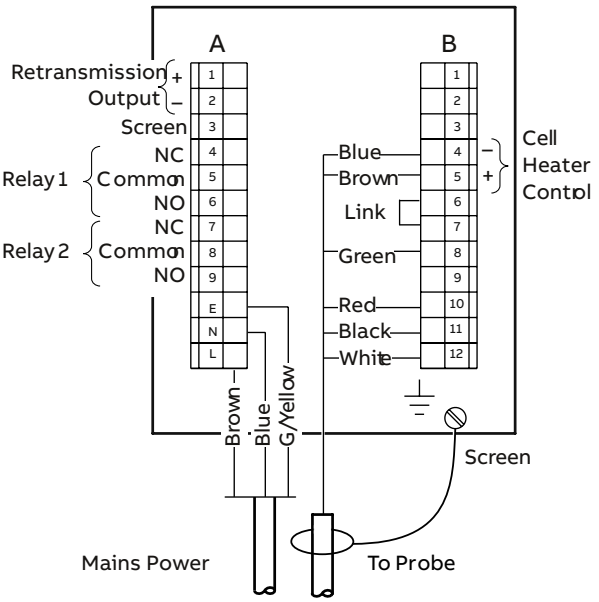


NC = Normally Closed
C = Common
NO = Normally Open

Figure 29 Connections – wall-/pipe-mounted instruments

8.6 Connections, panel-mounted units

Note. Slacken terminal screws fully before making connections.



NC = Normally Closed
NO = Normally Open

Figure 30 Connections – panel-mounted instruments

…8 Electrical connections for AZ10 probes backward-compatible with AZ100 systems

8.7 Connections, mains supply junction box

The probe and electronics unit MUST be connected to a common mains supply – see Figure 31. (Wall-/pipe-mount Electronics Unit shown, panel-mount similar).

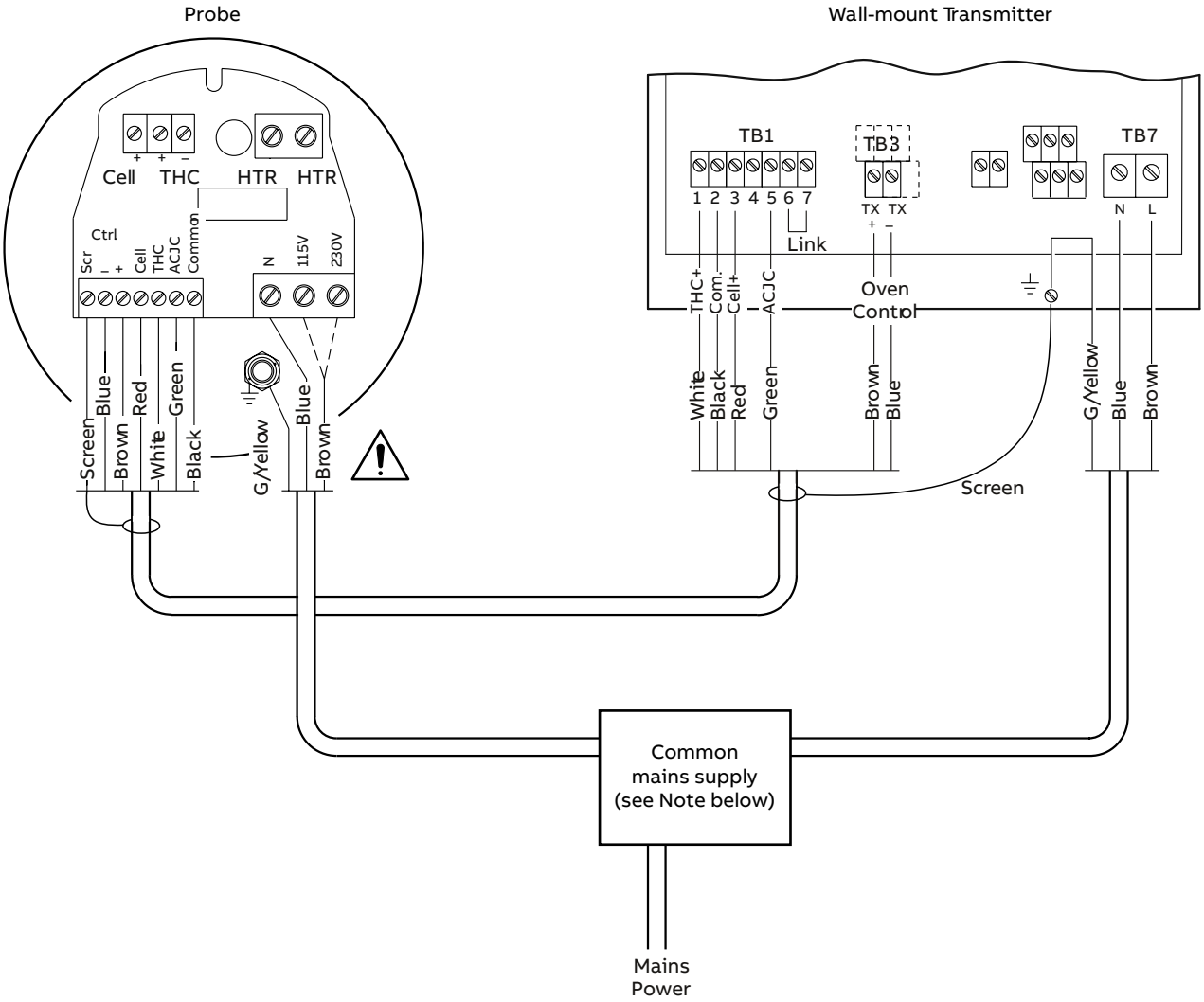


Figure 31 Connections – mains supply

⚠ WARNING

Ensure the mains supply live (line) cable is connected to the correct terminal according to the supply voltage (115 or 230 V).

NOTICE

The probe and electronics unit earth must be connected to a common supply to prevent earth loop currents.

9 Test gas and reference air connections

9.1 Test gas connection

⚠ CAUTION

Use clean dry instrument air free from hydrocarbons, or traceable certified bottled test gas mixtures of O_2/N_2 only.

The sensor has one test gas inlet – see Figure 32. A flowmeter must be fitted to the test gas line to restrict/regulate the flow. The pressure is set to 1 bar (15 psi) then flow is restricted by the flowmeter.

Refer to page 32 to page 35 for pneumatic entry types.

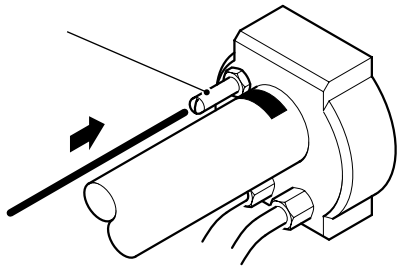


Figure 32 AZ10 probe – test gas connection

9.2 Test gas inlet

The sensor test gas (calibration) inlet is provided for in situ sensor testing using a test gas.

If the sensor is connected permanently to the test gas supply pipework:

- fit a high quality, corrosion-resistant (stainless steel), solenoid valve, manually operated valve or non-return valve (that is leak-tight even at zero back-pressure) in the pipework, as close to the test gas inlet valve as possible
- keep the valve closed when the calibration system is not in use

⚠ CAUTION

If the test gas connection is not sealed when not in use, air leaking into the sensor via the connection causes measurement errors. In a pressurized process, gases venting to atmosphere through the connection cause corrosion of, and/or block, the test gas tube. In a negative pressure process, air leakage causes high O_2 reading errors.

NOTICE

- It is preferable to use air (20.95 % O_2) as one of the test gases as this is the sensor's zero point. Alternative representative gases can be used according to local environmental conditions.
- To ensure better accuracy, use 2 test gases that represent the top and bottom limits of the known operating range.
- Due to resolution accuracies, do not calibrate the system with gases of less than 1 % O_2.

…9 Test gas connections

9.3 Test gas supply configurations – non-AutoCal systems

NOTICE

- If using the ABB-supplied test gas port with standard filter option, the test gas supply must be 3 to 3.5 L/min (6.354 to 7.413 scfh).
- Test gas can be connected to the supplied sensor test gas connection or via optional AZ10 AutoCal unit.
- If using customer's manifold, flows may differ from values shown below.

9.3.1 System using air as test gas 1 and bottled gas as (optional) test gas 2

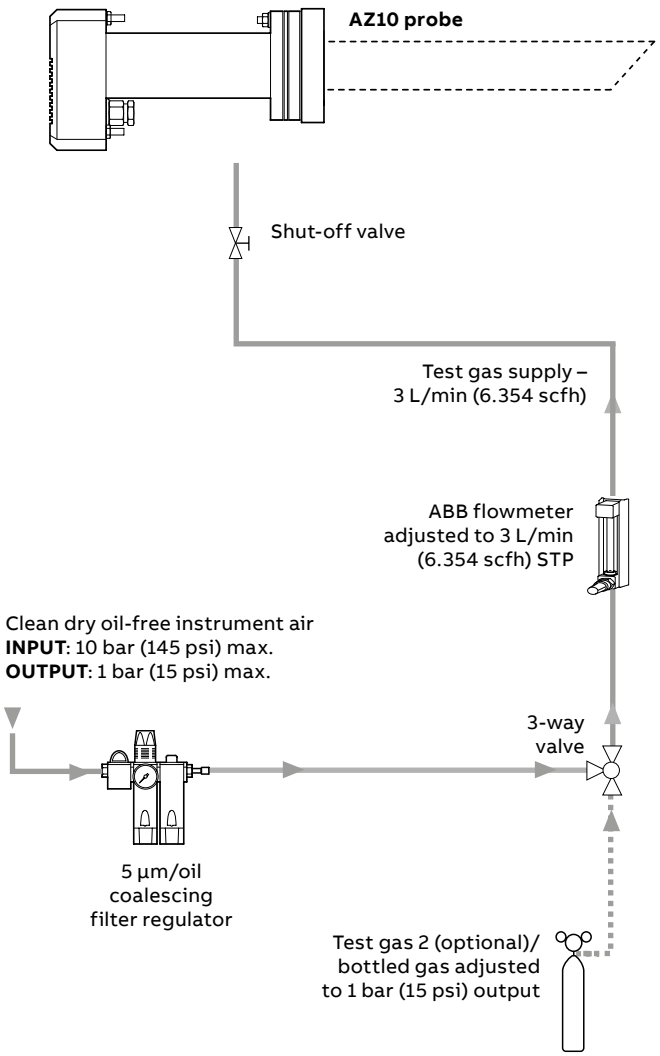


Figure 33 Test gas supply, non-AutoCal system – air (test gas 1) and optional bottled gas (test gas 2)

9.3.2 System using 2 bottled test gases

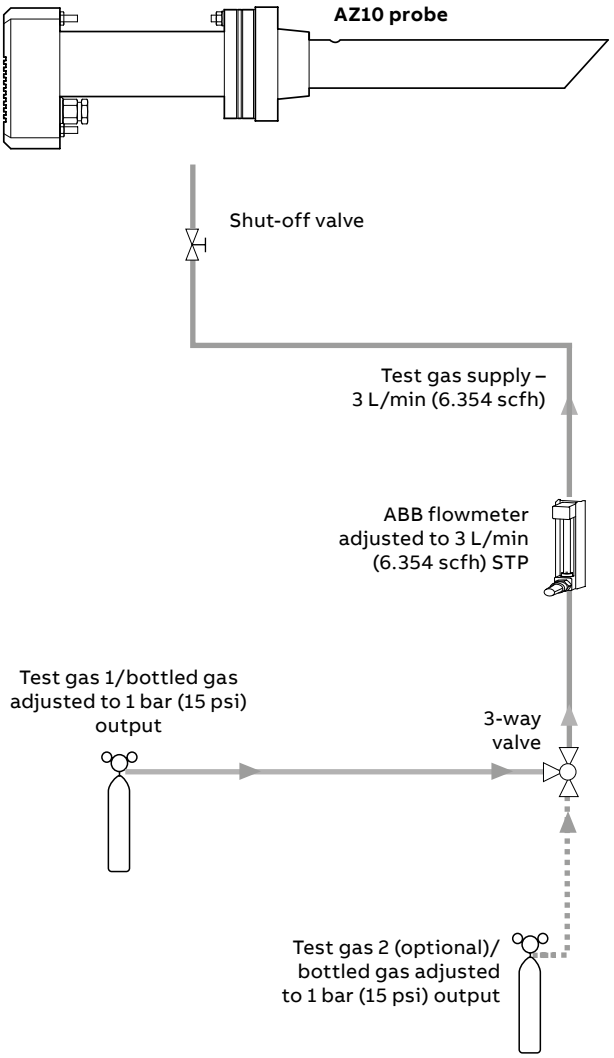


Figure 34 Test gas supply, non-AutoCal system – 2 bottled test gases

9.4 Schematic – AutoCal system

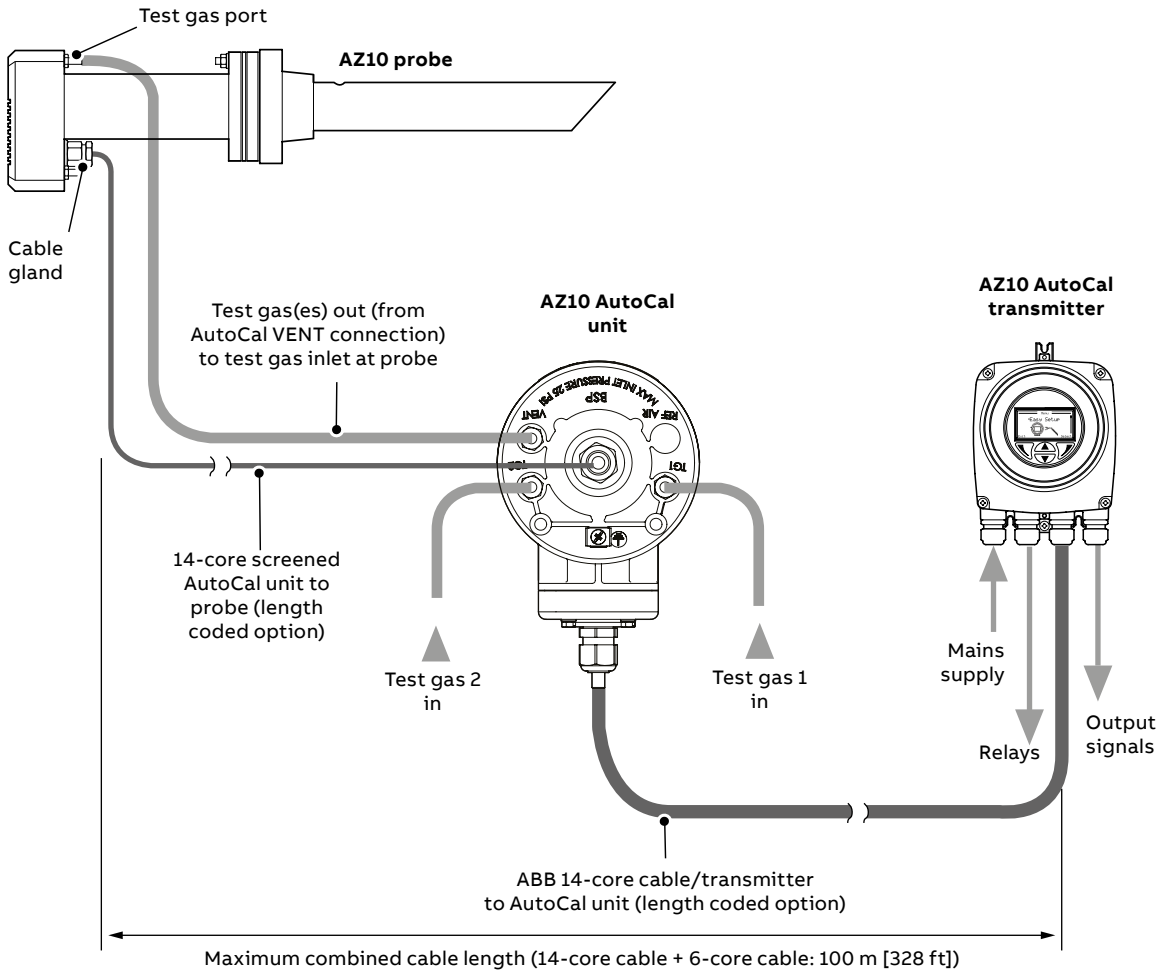


Figure 35 Schematic, AZ10 transmitter to AutoCal unit to probe

…9 Test gas connections

9.5 Test gas configurations – AutoCal systems with restrictors

9.5.1 System using air as test gas 1 and bottled gas as (optional) test gas 2

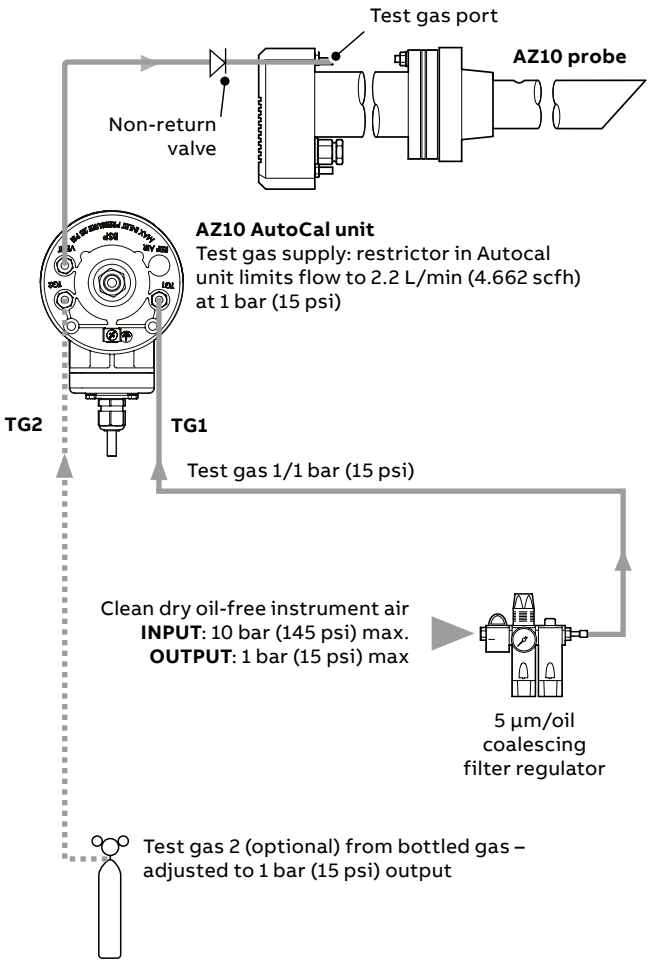


Figure 36 Test gas supply, AutoCal system with restrictors – air (test gas 1) and optional bottled gas (test gas 2)

9.5.2 System using 2 bottled test gases

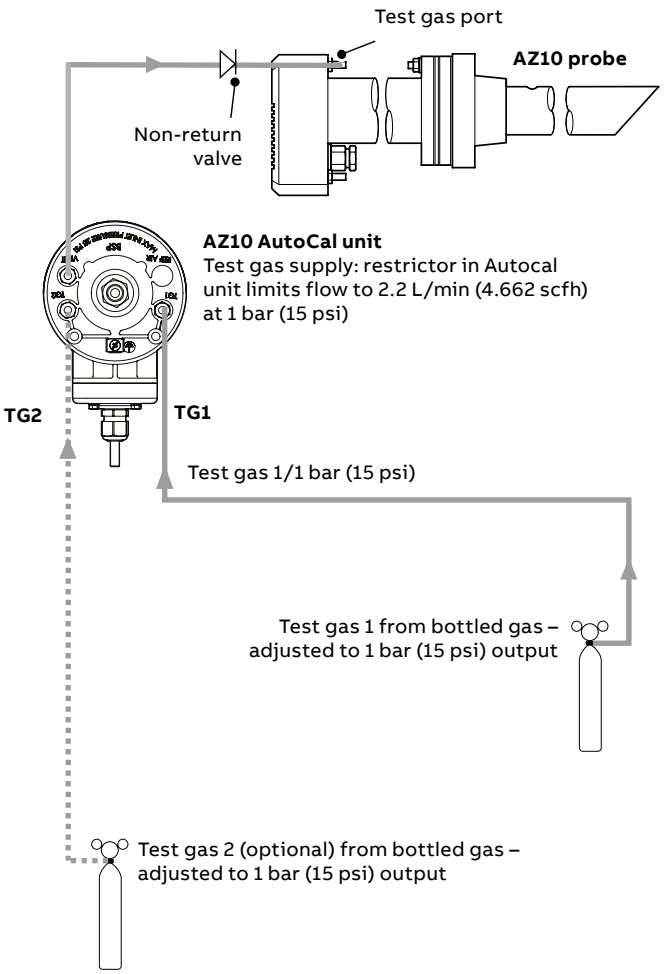


Figure 37 Test gas supply, AutoCal system with restrictors – 2 bottled test gases

9.6 Test gas and reference air supply configurations – AutoCal systems without restrictors

9.6.1 System using air as test gas 1 and bottled gas as (optional) test gas 2

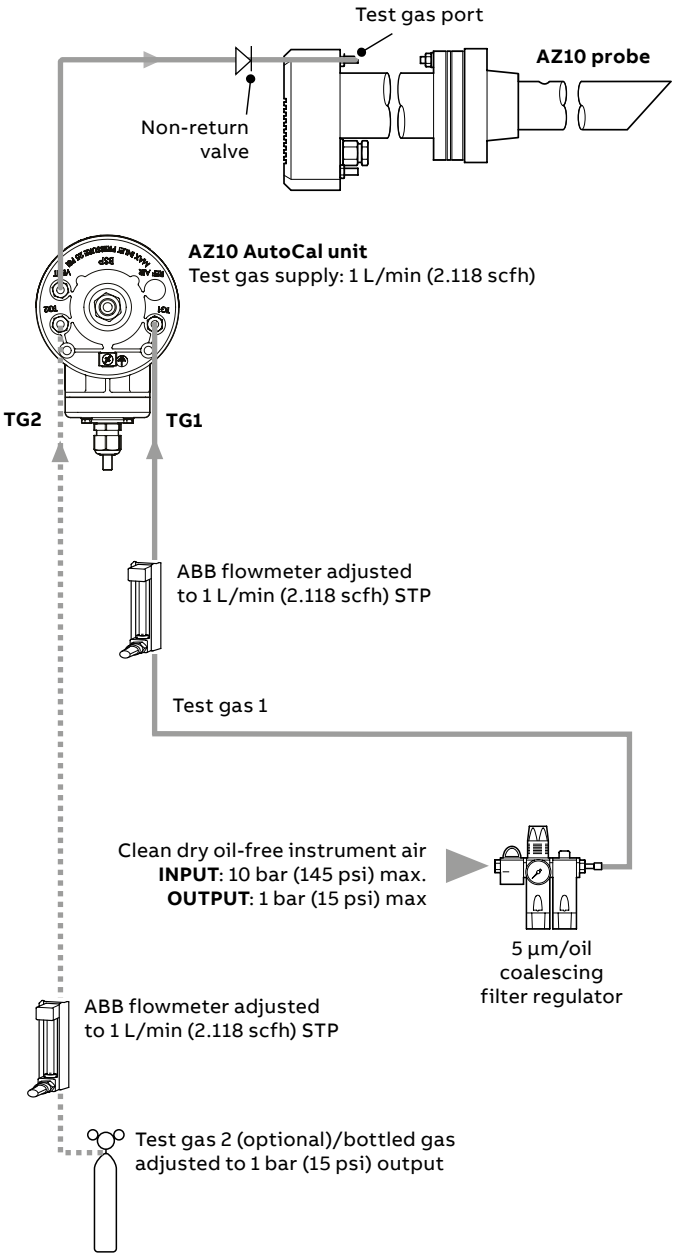


Figure 38 Test gas supply, AutoCal system without restrictors – air (test gas 1) and optional bottled gas (test gas 2)

9.6.2 System using 2 bottled test gases

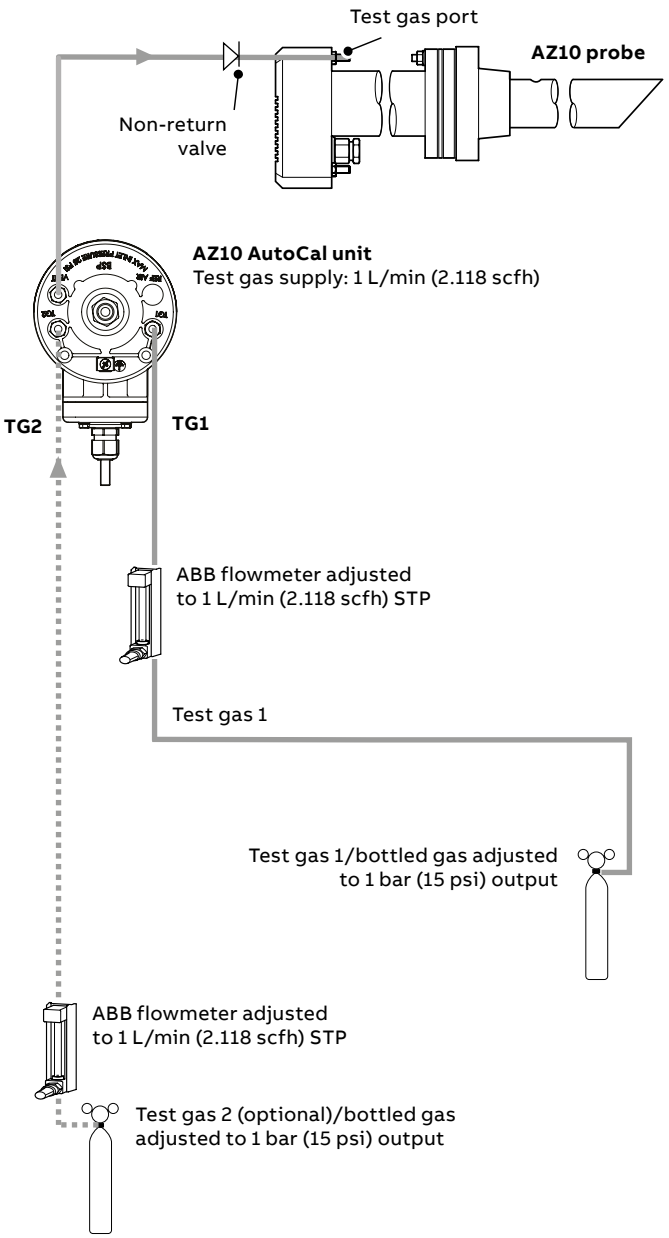


Figure 39 Test gas supply, AutoCal system without restrictors – 2 bottled test gases

...9 Test gas connections

9.7 Preparation and setting up test gases

⚠ CAUTION

If the test gas connection is not sealed when not in use, air leaking into the sensor via the connection causes measurement errors. In a pressurized process, gases venting to atmosphere through the connection cause corrosion of, and/or block, the test gas tube. In a negative pressure process, air leakage causes high O_2 reading errors.

1. If the sensor is not connected permanently to test gas pipework, ensure a blanking plug (to be supplied separately) is fitted securely to the test gas inlet connection on the sensor.
2. If the sensor is connected permanently to test gas pipework, ensure that a valve is installed in the pipework adjacent to the test gas connection and is closed.
3. Check the connections on both the sensor and the test gas bottles. Test gas connections must be checked for leak tight joints. Leaks can cause errors and drain away expensive bottles of test gas.
4. If the ABB-supplied test gas entry is used, this section prepares the system for manual calibration routines by setting up the test gas flows – refer to page 32 topage 35 for test gas supply configurations.

10 Start-up and operation

The AZ10 oxygen analyzer should now be ready to commission – refer to the transmitter User Guide (IM/AZ20E).

11 System specifications

Measurement performance

Range:

0.01 to 100 % O_2

Test gas response time

- Initial dead time 3 seconds
- T90 < 15 seconds

System accuracy

< ±1 % of reading or 0.05 % O_2, whichever is the greater, based on a nominal range of 0.01 to 25 % O_2

Drift

- < ± 1 % maximum % O_2 range value per month (without calibration)
- < ± 0.2 % typical

Error due to flue wall temperature changes

0.017 % of reading/°C (0.008 % of reading/°F) (based on a 2-point calibration against certified test gases)

Environmental data

Ambient operating temperature

- Transmitter -20 to 55 °C (-4 to 131 °F)
- Probe -20 to 70 °C (-4 to 158 °F)

Storage temperature

-40 to 85 °C (-40 to 185 °F)

Operating humidity

Up to 95 % RH, non-condensing

Sunlight

Store and operate out of direct sunlight

Ingress protection

- Probe (excludes remote/integral transmitter): IP66 (NEMA 4X)
- Electronics enclosures – remote and integral: IP66 (NEMA 4X)

Power supply

AC power supply

100 to 240 V AC ±10 % (90 V min. to 264 V max.) 50/60 Hz

Electronics

< 10 W

Probe heater

< 100 W

EMC

Emissions and immunity

Conforms to EN61326-1

Safety

General safety

Conforms to EN61010-1

Approvals and safety certification

CE mark

12 Probe specifications

Physical

Process connection

- ANSI B16.5 150 lb
- 2.5, 3 in
- DIN2501 Part 1
- 65, 80 mm
- 2 in NPT, 2 in BSP (flange pressure ratings do not apply)
- ABB standard flange

Probe body material

316L stainless steel

Mounting angle

Horizontal to vertically down

Process conditions

Standard process temperature

-20 to 800 °C (-4 to 1,472 °F)

Process pressure

Designed to withstand 35 kPa (5.1 psi) – positive or negative (pressure compensation required above 5 kPa (0.7 psi) – transmitter can apply fixed pressure compensation)

Operating requirements

Test gas

User-selectable, 100 to 0.1 % O_2 balance N_2 and/or air (air is recommended as one of the test gases)

AutoCal with restrictors	1 bar (15 psi) – flowmeters not required as restrictors preset flow to 2.2 L/min (4.662 scfh)
AutoCal without restrictors	1 bar (15 psi) – flowmeters required, set to 2.2 L/min (4.662 scfh) flow
No AutoCal	1 bar (15 psi) – flowmeter required

Calibration

Manual, semiautomatic or automatic (controlled by Endura transmitter)

Automatic calibration unit

AutoCal hardware

- Built-in solenoid valves for control of test gas flow
- Built-in pressure switches to detect presence of test gases

Heater operational requirements

Probe

Nominally 190 Ω, 70 W at 115 V AC – power is limited to 70 W max. by transmitter over an 85 to 265 V AC range

13 Transmitter specifications

Transmitter enclosures

Remote

Wall-mounted
4 gland entries
Optional ½ in NPT, M20

Automatic calibration

AutoCal hardware

- Isolated solenoid valve control as standard, 24 V @ 2 W per valve*
- Dedicated isolated digital inputs to monitor pressure switch contacts as standard – voltage-free, normally closed with gas present

Display and switches

Display type

Graphical 128 × 64 pixel LCD

Display backlight

Green LED

Operator switches

4 capacitive switches (operated through the front glass)

Relay outputs

Number

2 standard

Type

Normally closed, 5 A @ 230 V AC
or 30 V DC (non-inductive)

Functions

User-configurable – can be activated by one or more of the following signals:

- Process alarm 1, 2, 3, 4
- Calibration in progress
- Calibration failed
- Out of test gas 1, 2
- Test gas 1 valve control
- Test gas 2 valve control
- Failure diagnostic
- Out-of-specification diagnostic
- Maintenance required diagnostic
- Function check diagnostic

Analog outputs

Standard

- 1 isolated current output
- Programmable to retransmit oxygen (linear or logarithmic) or temperature
- Programmable over 4 to 20 mA
- Over-range capability to indicate system failure programmable from 4 to 22 mA

Optional

- 1 isolated current output
- Programmable to retransmit oxygen (linear or logarithmic) or temperature
- Programmable over 0 to 20 mA
- Over-range capability to indicate system failure programmable from 0 to 22 mA

* For driving internal automatic calibration (AutoCal) probes or can be used to drive external calibration units on remote transmitters only.

Digital I/O

Number of digital I/Os

2

I/O configuration

User-configurable as either input or output

Input type

Volt-free contact

Output

Transistor switch capable of sinking 220 mA, low output, < 2 V DC, switch voltage 30 V DC maximum

Isolation

Not isolated from each other or from the microprocessor circuitry

Input functions

- Automatic calibration start on falling edge (when a volt-free switch is closed)
- Automatic calibration start on rising edge (when a volt-free switch is open)
- Automatic calibration stop on falling edge (when a volt-free switch is closed)
- Automatic calibration stop on rising edge (when a volt-free switch is closed)
- Automatic calibration start/stop – starts auto-calibration on falling edge (volt-free switch is closed) and stops auto-calibration on rising edge (volt-free switch is open)
- Select 1-point/2-point calibration type – high level (volt-free switch is open) selects 1-point, low level (volt-free switch is closed) selects 2-point

Output functions

- Process alarm 1, 2, 3, 4
- Calibration in progress
- Calibration failed
- Out of test gas 1
- Out of test gas 2
- Test gas 1 valve control
- Test gas 2 valve control
- Failure diagnostic
- Out-of-specification diagnostic
- Maintenance required diagnostic
- Function check diagnostic

HART communications

Version

5.7 as standard

Integration

- Device Type Manager (DTM) and Electronic Device Description (EDD)
- Provide online/offline device configuration, online monitoring of measurement values and diagnostic states

DTM

- FDT v1.2.1 compliant
- Works with FDT framework packages (for example, ABB Asset Vision Basic)

EDD

Compliant with suitable framework tools (for example, SDC 625 and Simatic PDM tools)

Languages

English

Calibration

Manual calibration

- 1 point (offset)
- 1 point (factor)
- 2 point (offset + factor)

Automatic calibration

- 1 point (offset)
- 2 point (offset + factor)

Calibration control

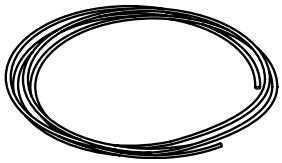
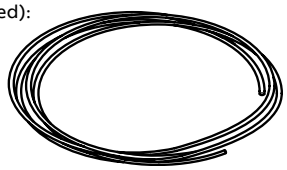
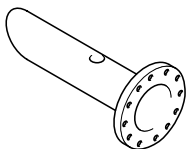
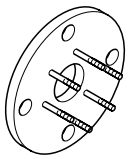
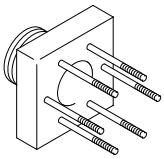
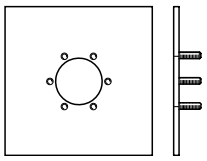
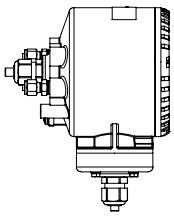
- Front panel controls
- Digital inputs
- HART commands
- User-defined schedule

Calibration scheduler

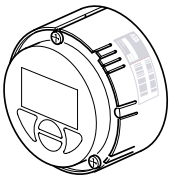
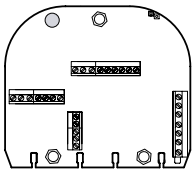
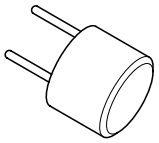
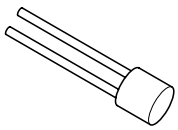
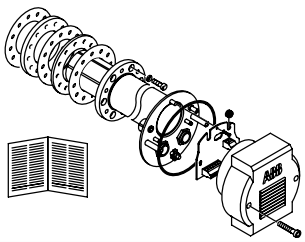
User-defined schedule enables automatic calibration frequency to be set from 1 day to 12 months

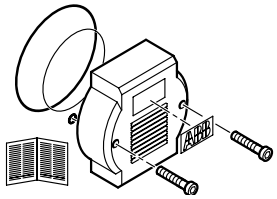
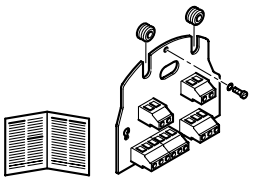
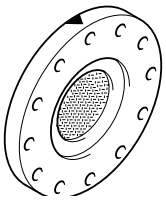
14 Accessories and spares

14.1 Accessories

Part number	Description	
	Sensor cable (standard):	
AZ200141	5 m (16.4 ft)	
AZ200142	10 m (32.8 ft)	
AZ200143	25 m (49.2 ft)	
AZ200144	50 m (164.0 ft)	
AZ200145	75 m (213.2 ft)	
AZ200146	100 m (328.0 ft)	
	Sensor cable (CSA-approved):	
AZ200431	5 m (16.4 ft)	
AZ200432	10 m (32.8 ft)	
AZ200433	25 m (49.2 ft)	
AZ200434	50 m (164.0 ft)	
AZ200435	75 m (213.2 ft)	
AZ200436	100 m (328.0 ft)	
	Sample guide tube	
AZ100078	200 mm (9.84 in)	
AZ100079	350 mm (15.75 in)	
AZ100080	500 mm (21.65 in)	
AZ100081	650 mm (27.56 in)	
	Flange adapter	
AZ100092	2.5 in ANSI	
AZ100093	3 in ANSI	
AZ100094	DIN 65	
AZ100095	DIN 80	
	Adapter	
AZ100096	2 in NPT	
AZ100097	2 in BSP	
AZ100098	Mounting plates for ABB standard flange	
	Endura AZ10 AutoCal unit (without test gas restrictors)	
AZ250098	BSP	
AZ250096	NPT	
	Endura AZ10 AutoCal unit (with test gas restrictors)	
AZ250099	BSP	
AZ250097	NPT	

14.2 Spares

Part number	Description	
	AZ20 Transmitter cartridge:	
AZ200 750	Standard	
AZ200 751	Standard + analog O/P	
AZ200 752	Standard + digital O/P	
AZ200758	Remote (type 4) transmitter backplane	
AZ200724	Probe heater circuit fuse	
AZ200725	PT1000 cold junction compensation	
AZ100065	Seals and fixings kit	

Part number	Description	
AZ100068	Lid assembly spares kit	
AZ100256	Probe terminal PCB	
AZ100069	Probe filter kit	
AZ100057	M20 gland large bore kit	
AZ100070	½ in NPT gland large bore kit	

Acknowledgements

• HART is a registered trademark of the FieldComm Group.

Notes

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ABB Measurement & Analytics

For your local ABB contact, visit:
www.abb.com/contacts

For more product information, visit:
www.abb.com/measurement

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